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Passenger Charges Scheme Confirmed

THE British Transport Commission (Passenger) Charges Scheme, 1954, has been confirmed by an order made last Monday by the Transport Tribunal. The new scheme will have effect from September 26 and revokes the British Transport Commission (Passenger) Charges Scheme, 1953. Such provisions of the 1953 scheme as apply to British Railways outside the London Area (roughly within a radius of 25 miles from Charing Cross) which are not affected by the new scheme, remain unchanged. Details of the provisions relating to the London Area were given in our July 16 issue. The increases apply to the London Area lines of British Railways, including the London, Tilbury & Southend line, and to London Transport railways and road services. The main effects will be to increase British Railways' Tilbury Line and London Transport Underground and road services single fares; perhaps the most controversial item is the raising of the 3½d. fare to 4d. Early morning road single fares for most distances over a mile will be slightly increased, and British Railways and Underground early morning return fares also will be augmented. There will be inconsiderable rises in British Railways day return fares in the London Area; those priced at 2s. and over are unchanged, as are ordinary single fares. Season tickets for distances above one mile will bear a flat increase of 2s. a month with corresponding increases for weekly and three-monthly season tickets. The estimated additional revenue produced by the increases is £4,378,000 a year, of which some £700,000 will accrue to British Railways. This figure is £922,000 less than would have resulted from the proposals first put forward by the Commission, which will now be faced with the task of bridging the gap by other means. What these other means may be is difficult to forecast, as Sir John Elliot, Chairman of the London Transport Executive, said when introducing the Scheme in April last that every effort had been made to achieve economies. London Transport fares will be some 92 per cent above prewar fares when the Scheme comes into force, and costs have risen by 140 per cent. With British Railways, some economies through increased efficiency in operation, which must include their lines in the London Area, may result from the discussions being held between the Commission and the three railway unions. Reduction of services is unlikely to achieve any useful result.

Railway Wages

EFFORTS to solve the railway wages deadlock were still being made as we went to press, after the proposals of the British Transport Commission for a revised wages structure had proved unacceptable to the three railway trades unions. The Chairman of the Commission, Sir Brian Robertson, agreed to the request for a meeting with him of representatives of the National Union of Railwaymen, and similar facilities for talks were offered to the Associated Society of Locomotive Engineers & Firemen and the Transport Salaried Staffs' Association. The talks earlier this week resulted in adjournment, with the prospect of further meetings to follow without undue delay. The A.S.L.E.F. representatives stated that they would refer the matter to the Railway Staff National Council, the next stage in the negotiating machinery. There have been strike threats by some N.U.R. and A.S.L.E.F. local committees if their unions' demands are not settled to their satisfaction, but so far they have not been widespread, and strike action so far seems remote, whilst the trade unions are showing some moderation.

Western Region Winter Passenger Services

RETENTION throughout the winter of certain expresses introduced for the present summer season, faster schedules than as compared with last winter, and the introduction of sleeping car facilities between Paddington, the Midlands, and the North, are the outstanding features of British Railways, Western Region, winter timetable. "The Bristolian," covering the 118½ miles between Paddington and Bristol in 105 min. Monday to Fridays; the 9.30 a.m. Paddington to Plymouth weekdays; and the "Cambrian Coast Express" leaving Paddington at 10.10 a.m. and returning from Aberystwyth at 11.15 a.m. on weekdays, will continue to run on their present schedules. A popular facility to be retained is the through coaches between stations in the West of England and Glasgow. Re-timing of some South Wales to London expresses gives regular departures from Cardiff General to Paddington, departure times being at the hour, a welcome innovation for the travelling public, and corresponding to the 55 min. past the hour departures from Paddington. Suburban services in the Birmingham area have been completely revised and will run on a regular interval basis; involving increased train mileage of over 3,000 miles a week. The new scheme, similar to that successfully introduced a year ago in the Cardiff area, makes better use of motive power and train crews during off-peak periods.

Jubilee of a Canadian Express

THE "Ocean Limited" of Canadian National Railways celebrates its fiftieth anniversary this year. The train, which runs between Halifax and Montreal, epitomises the advances made in Canadian railway operation over 50 years. The sleeping cars were originally of wooden construction and decorated in dark hues. Mattresses were filled with felt. The day coaches were also of wooden construction, with gas lighting and straight-backed seats. The present train is of all-steel construction, with air-conditioning and decoration in pastel shades. The "Ocean Limited" ran throughout the two world wars, and in the second was regularly duplicated. These duplications eventually became the "Scotian," which carries both day coaches and sleeping cars. The original North Street Station from which the train ran was destroyed in the Halifax explosion of 1917 and was replaced by a modern station linked to the ocean terminal. The Bonaventure Station in Montreal has also given way to progress and the eastbound "Ocean Limited" now leaves from the Central station, one of the most modern in the continent. The train is at present steam-hauled, but diesel haulage is expected in the near future.

Effects on Traffic of Food De-rationing

THE de-rationing of foodstuffs in this country during the last few months has had the inevitable result of some reorientation in freight, and especially express freight, traffic trends. In the case of margarine, for instance, special arrangements have had to be made to cater for the altered distribution now required by the trade. About 1,600 tons are conveyed weekly by the Eastern Region alone in new wagons, including some pallet wagons, which have been recently set aside for this traffic. Although this tonnage is relatively small, the organisation of express freight train services to convey margarine from manufacturers' premises to distributors and retailers to ensure its being on sale at the time desired is a complex business. The transport in Britain of meat by rail has for many years been efficiently organised, and the recent de-rationing presumably has put that traffic back on to something like a prewar footing. Road competition has accentuated the necessity for quick and punctual transits by rail.

The New Moerdijk Bridge

THE Netherlands Railways route between Dordrecht and Lage Zwaluwe, connecting the provinces of South Holland and North Brabant, was carried as a single line over the Waal and Meuse estuary by the Moerdijk bridge, 1,607 ft. long, opened in 1872. It had 14 fixed spans and one swing span for shipping near the south end, but this was replaced some 20 years ago by an embankment, and the bridge raised gradually towards that end to give extra clearance for navigation. The bridge was the longest in the country. It suffered considerably in the last war; six spans were destroyed and three more badly damaged. After the liberation in May, 1945, two more were taken to help restore the road traffic bridge nearby. The four northernmost spans were then replaced by an embankment and with the aid of some temporary material the gaps were made good and the railway service restored in August, 1946. Such parts of the original structure as remained were at the end of their life and as the single line section delayed traffic, it was decided to rebuild the bridge to carry a double line. The piers had already been widened and the first span of the new structure was placed in position on July 11, with appropriate ceremony. The new bridge is expected to be completed by the end of next year. An account of the work appears on another page.

Railways and Internal Air Services

THE effect on the growth of internal air services of an efficient railway service was brought forcibly to the notice of a New Zealand Government Railways official during an overseas visit recently. Mr. G. S. J. Reid, Inspecting & Test Engineer for the Railways Department, left New Zealand last September to establish an inspecting and advisory service in the office of the New Zealand High Commissioner in London, and he visited a number of countries in Europe and also the U.S.A. before returning to New Zealand. He formed the opinion that in Britain the frequency and speed of the railway service had resulted in internal air services being few, whereas in the U.S.A. air services operated extensively in competition with services which were costly and infrequent. Mr. Reid was deeply impressed with the service provided by British Railways. Their efficiency, he said, was reflected in the mail service. Letters posted in London before 7.30 p.m. were delivered anywhere in England by the morning. The barrier to faster services in New Zealand was not the narrowness of the gauge but the frequent curves and stiff gradients. He found that in practice New Zealand railway schedules did not compare unfavourably with those overseas.

New Control Room at Woking

THE completion of the new control room at Woking, Southern Region, British Railways, marks the final stage of that Region's postwar programme for rehousing operating control staffs. The new room is light, airy, and in strong contrast to the wartime accommodation which has been vacated. The control desks and diagrams are grouped in a central block in similar style to that of the other Southern Region London Districts at Waterloo, Redhill, and Orpington. The building is described on another page of this issue. The wide range of traffic dealt with at Woking can be realised from the extent of its authority, which covers some 400 route miles, including the main line from Waterloo to Portsmouth and the West of England line as far as Salisbury. There is heavy suburban traffic in the London area covered, and holiday traffic and boat trains present special problems. The freight traffic is considerable, including the heavy interchange traffic with other Regions via Feltham. The preponderance of passenger trains in the District tends to make a proportion of the work of this office a watching brief, but on occasions such as the bridge collapse near Guildford on August 14 its value is demonstrated to the full.

U.S.A. to Order Locomotives for India

A CONTRACT to build 100 "WG" class steam locomotives and 5,000 wagons for the Indian railways is expected to be awarded in a few days by the United States Foreign Operations Administration, according to Mr. Harold Stassen, Director of the Administration. Reports from Washington suggest that Japan may obtain the order for the locomotives, for which its price of $81,470 (£29,096) apiece, is said to be the lowest quoted. The North British Locomotive Co. Ltd. has tendered for the locomotives, and tenders have also been received from manufacturers in France, Belgium, Germany, Italy, and the United States. The locomotives and wagons are to be paid for in American funds. It is also reported that India has placed an order with Hitachi Seisakusho KK. for 165 steam locomotives of an unspecified type, diesel railcars, wheels and axles. The Hitachi plant is one which was visited by Mr. F. C. Badhwar, Chairman of the Indian Railway Board, during a recent tour of Japan, and this firm obtained an order to build 100 "WG" locomotives in the Indian Railway Board 1954-55 programme.

Diesel Locomotive Production

IN the last four years diesel locomotive production in Great Britain has varied from 491 to 593 units a year, and not in crescendo order. A larger number of orders might tend to stabilise production, but not to a great degree. Despite technical improvements locomotive deliveries, and locomotive production—say in tons weight—per worker employed, are not what they were before the war. Now that certain material shortages have been somewhat eased, reason may well be found in the productivity and attitude of labour. The recent *Review of Productivity in the Diesel Locomotive Industry* issued by the British Produc-

tivity Council does not, however, take note of this. It deals solely with the technical aspect of production, and says little that advances what was said at the Blackpool conference in 1951. A locomotive manufacturer might reasonably ask if it is now worth his while to strive to the uttermost, as most have done for several years, to improve techniques which might give outputs better by 5, 10, or even 15 per cent, and a 5 per cent quicker delivery, when all the time the labour problems which govern the other 85—95 per cent remain unsolved, and largely unapproached, by those official and semi-official authorities whose business it is to solve them, but whose time is spent in urging the industry to greater production.

The Watford Accident

EFFICIENCY of the train communication apparatus probably will be the question of the greatest interest to the public of those dealt with in the report, summarised elsewhere in this issue, of the Chief Inspecting Officer of Railways, Lt.-Colonel G. R. S. Wilson, on the derailment at Watford on February 3, 1954. A passenger pulled the chain in the ninth vehicle of an express, after derailment of a bogie immediately ahead; but the driver remained unaware of anything until further derailing and parting of couplings produced a full brake application. Some tests, with Colonel Wilson on the footplate, showed it to be possible to run a considerable distance without realising that the chain had been pulled, unless attention was being directed to the vacuum gauge; and that something more effective was desirable.

The history of train communication dates back many years and was one of the subjects considered by the International Congress at St. Petersburg in 1892. The reporter was Mr. H. Pollitt, later Locomotive Engineer of the Great Central Railway, then the Manchester, Sheffield & Lincolnshire. He stated that something of the kind had been recognised as necessary as early as 1847; between then and 1865 several conferences were held to discuss it, here and on the Continent, with the result that in 1868 the Parliament of the United Kingdom enacted that communication, in such form as the Board of Trade should approve, was to be provided from April 1, 1869, on every passenger train which, at any part of its journey ran more than 20 miles without a stop, with a maximum penalty of £10 for every case of default. The maximum penalty of £5 for operating the communication "without reasonable and sufficient cause" also was prescribed and this legislation remains in force today.

Many devices, suggested by various inventors, had been subjected to trials on the North Eastern Railway between York, Harrogate, and Scarborough in the same year. One of these, under which a cord was threaded through guides on the right-hand side of the carriage above the windows, able on being pulled to set a clockwork bell ringing in the guard's van and open the engine whistle—said to have been proposed by T. E. Harrison, the Engineer of the N.E.R.—was submitted to John Bright, the President of the Board of Trade, and received provisional sanction on February 27, 1869, although this was against the judgment of the Chief Inspecting Officer of Railways, Captain H. W. Tyler, and his colleagues, according to that officer's evidence before the Royal Commission of 1874. Formal approval was given in August, 1869, and many railways used the equipment, but a few, such as the South Eastern, applied electrical apparatus, and some forms of that, such as the Stroudley and Rusbridge on the Brighton line, remained in use down to the grouping in 1923. They involved electrical coupling between the coaches, with maintenance of batteries and bells, but enabled conventional signals to be exchanged between guards and drivers, used in connection with slip coach working. They had the advantage that the warning was given with full effect at once.

The cord apparatus was not easy to operate. The window had to be opened to reach the cord and the slack necessary to allow of curves and crossovers being negotiated hauled in before the alarm could be given. Many failures occurred and on one occasion Captain Tyler himself, although exerting all his strength and weight, could not give the warning. The Board of Trade withdrew its sanction as from January 1, 1873; nevertheless the system continued in use and it was admitted to the Royal Commission, which directed special attention to the subject, that the law was being set at defiance. The commissioners recommended that the 20-mile limit in the Act of 1868 should be amended to eight, but no legislation, beyond an Act calling for certain returns to be made, followed this or any other of their recommendations. Captain Tyler expressed the ideal to be aimed at when he said that the simplest apparatus "must clearly be that which will require no adjustments as trains are being made up, but which, as soon as the couplings are completed, is at once in perfect order throughout the train."

It is not known who first suggested making use of the continuous brake to effect communication but T. Urquhart, engineer to the Grazi-Tsaristin Railway in Russia, in a paper to the Institution of Civil Engineers in 1891, said he had done so when the automatic vacuum brake was adopted on that line by his recommendation in 1886. He too found the mere brake application not invariably effective in attracting attention immediately; and he therefore added an arrangement whereby if train pipe vacuum became reduced a whistle warning was sounded on the engine. This feature was present also in several of the air brake systems reported on by Mr. Pollitt as in use in France, Belgium, and Germany, with an attachment preventing such whistle from sounding when the driver himself applied the brakes. The French Minister of Public Works had in 1880 called for communication whenever a train ran 16 miles nonstop, and in 1886 on all passenger trains without exception from January 1, 1888. The Northern and Eastern lines used electrical systems and the other French railways the brake method.

Trials with the latter were undertaken here on the M.S.L.R. in 1890 before Major-General C. S. Hutchinson and Colonel F. H. Rich. The design was such that pulling the chain or handle in only one compartment reduced vacuum by 50 per cent, which stopped a 186-ton train against the steam from 40 m.p.h. in 37 sec. It was possible to overcome this action temporarily by using the large ejector, but not if the alarm was given in more than one vehicle. A provisional approval was at once accorded and confirmed in 1893. In 1898, following the report of a committee, the Board wrote to all the companies positively condemning the cord system and asking them what they intended to do. To this they replied that they had agreed in principle to adopt the brake method and this, in the course of time, became the general practice on railways in this country.

As Colonel Wilson observes, it has "stood the test of time on practically all the railways in the world," but he feels that the present arrangement "at any rate with the vacuum brake," is not sufficiently positive and recommends a thorough review of its design with the object of obtaining quicker response. Our main-line trains are certainly very different from the one used in the 1890 demonstrations and perhaps we are not getting the right reduction of vacuum with the apparatus used today. A really serious emergency may indeed very seldom arise, but when it does it is important that the alarm shall be noticed by those concerned immediately.

Technical questions as to the merits of bull-head and flat-bottom rails and the best way to maintain track, in tunnels or out of them, can be left to the engineers concerned, who can be relied on to do everything practicable to attain the most efficient results, if they are given the necessary support and resources, though at times they may commit an error of judgment. The public, however, is vitally interested in the problem of attracting adequately trained technical staff and labour to the nationalised railway system. This has figured in several accident reports of recent years. Not only in connection with rolling stock and track does it cause anxiety. Its effects are being felt also in signalling and telecommunications, with the con-

stant increase of more elaborate equipment, so different from that ruling less than a lifetime ago. Mechanisation is only a partial solution, as Colonel Wilson observes, and unless the problem is solved reasonably satisfactorily before very long, attention may be drawn to its existence in a way even more unpleasant than has so far been the case.

The Netherlands Railways in 1953

HARDLY had the Netherlands Railways finished the task of making good the extensive and serious damage suffered in the last war than they had to face at the beginning of last year that of coping with the havoc left by the storm which broke over the country on January 31. Fortunately no fatalities among the staff resulted but, despite the utmost willingness and effort on the part of all concerned, which restored the traffic on some routes very quickly, some lines could not be brought back to normal for a considerable time, and not until August 3 was complete restoration effected. Much assistance was rendered from outside the country, especially by the management of the French National Railways, and this is gratefully acknowledged in the annual report for 1953, a copy of which has been sent us by the General Manager, Mr. F. Q. den Hollander.

The area served is comparatively small and topographical conditions are such that a greater part of the train service partakes of an outer suburban character, main-line services in the usual sense being through ones to other countries, with few runs of any great length within Holland. Electrification continues to make progress and 43 per cent of the freight train-miles are now operated electrically. The diesel-electric locomotives now on order, when received, will displace further steam locomotives. The inauguration of electric traction between Arnhem and Zwolle has effected a great improvement in working, and it is expected that by the end of 1954 steam haulage of passenger trains practically will have disappeared. Delivery of new rolling stock has enabled more frequent services to be put on, especially between Amsterdam and Rotterdam via Gouda, giving a good alternative to the route via Haarlem. Despite this, the demand for passenger accommodation exceeds available seating and much depends on the productive abilities of the various suppliers.

Some new stations have been opened and others greatly improved. It is intended to do much more in this direction so as to make rail travel increasingly attractive. In some places bus services have been instituted in conjunction with the railway, in pursuance of this general policy. Special attention also has been directed to the encouragement of tourist traffic and measures taken in association with foreign managements in support of the plan. Many siding connections were brought into use during the year to serve factories and works and co-operation with the national association of packers and private freight transport undertakings was continued with much success. Close association also was maintained with the various international transport associations such as the International Union of Railways. The research section of that body, the O.R.E., is, in fact, under the special care of the Netherlands Railways management and its purpose is to introduce as much rationalisation as possible into the design and use of rolling stock by the various European countries.

Electrification and introduction of diesel-electric equipment have been accompanied by improvements in signalling. Automatic colour-light working has been again extended and at December 31, 1953, nearly 200 miles of it were in service, while power interlocking of the latest type has been brought into use at Eindhoven and is in course of application elsewhere. Flashing light installations at level crossings have been added to. There are 115 now in service and by the end of 1953 nine crossings had the new half-barriers and warning lights. Equipment at some attended crossings also was improved.

Total route mileage at the end of 1953 was 1,040 single and 941 double line, of which 834 miles were operated electrically. A length of 11 track miles was laid with concrete sleepers as an experiment. A beginning was made with the reconstruction for double line of the great bridge over the Hollandsche Diep at Moerdijk. The raising of the tracks at certain places, as at Leyden, to get rid of the tiresome level crossings, was continued.

Seven electric, two diesel train units and 12 diesel-electric locomotives, rendered useless in the war, were brought back into service and new deliveries included four electric and 19 diesel-electric locomotives, 20 single diesel-electric coaches, 14 diesel-electric two-car sets and 243 goods wagons of various kinds. A considerable number of new passenger vehicles are on order. Total staff employed at the close of the year was 34,171, although a number were temporarily absent for military and other reasons.

Total receipts were fl. 373,900,000, an increase of 20 millions, derived from both passenger and goods traffic, but costs rose by 14·1 millions to fl. 304,800,000, to a considerable extent the result of the increased maintenance called for by the extra traffic, almost all classes of which showed an improvement. Depreciation amounted to fl. 57,400,000, an increase of fl. 3·5 millions but interest charges fell, due to some extent to the improved working of certain subsidiaries. Of the surplus of 8·8 millions, fl. 4 million is carried to reserve for use in carrying out the plans agreed on with the authorities for eliminating more level crossings. The heavy debt taken over from the old companies in 1937 for pension funds has at last been paid off. For the first time in some years return ticket traffic improved, while passengers also made longer single ticket journeys, a consequence of the general improvement in the services. Loss of short-distance traffic to other means of transport seems now to have been halted.

Design of Ore Wagons

THE comparative merits of British and foreign ore wagons are considered in the third annual *Survey* of the British Iron & Steel Research Association. Ore trains of four-axle wagons in North America and Europe are lighter and shorter, and consist, it is stated, of fewer wagons than British trains carrying the same amount of ore. Investigation has shown the reason for this to lie rather in the larger loading gauge and heavier axle loading permitted in these countries than in the type of wagon. True comparisons are only possible if the various designs are considered with the physical limitations of the British railway system in mind. With present axle loads (17½ tons in Britain), four-axle wagons show to advantage both in length of trains and in the number of vehicles. As the *Survey* points out, such wagons demand tipplers and weighbridges to match, and if such equipment is available it will also handle two-axle wagons in pairs, which will cheapen handling costs. British Railways are, however, now moving towards an axle loading of 22½ tons, and when such loading is in force the advantage of the four-axle wagon disappears. In these circumstances British ore is light enough in relation to bulk to fill the wagons before the permitted axle load is reached, and the closer wheel spacing of the four-axle wagon is no longer of use.

The four-axle wagon maintains its advantages when carrying imported ore at the higher axle loading. Where material is heavy in comparison with bulk the weight limit is reached before the capacity limit, and the narrowness of the bodies of four-axle wagons (necessitated by the permissible "throw" round curves) is no handicap. The B.I.S.R.A. concludes that iron ore wagons for general service, or for home ore only, should be of the two-axle type, and that the present 27-ton tippler wagon, costing some £400, is probably the most efficient railway wagon in the United Kingdom.

Where imported ore only is to be handled, the advantages of the four-axle wagons are such that they should be considered in spite of their extra cost, or possibly a three-axle wagon, as used in Sweden, might be advantageous. The *Survey* makes the general remark that all new tipplers and weighbridges in Britain should be capable of handling wagons with a gross weight of at least 45 tons, to allow for future increases in axle loads.

Materials for Track Ballast

APART from the requirements of main lines carrying heavy and fast traffic, the types of material used for track ballasting generally depend upon availability within reasonable distance of the site. The importance of main lines warrants the laying of the best possible material even if cost of carriage from the source of supply is heavy. It is generally agreed that the ideal ballast is hard stone broken to suitable sizes (*a*) for ordinary use including boxing, and (*b*) for shovel packing, measured or otherwise. After crushed stone, other materials favoured in order of merit are shingle or gravel, slag, shell, broken overburnt brick, sand, cinders or ashes, and even some kinds of earth. In South East Asia moorum, if it contains laterite, is sometimes worth using.

The main characteristics of good ballast are that it should be hard, heavy, resistant to crushing, shock abrasion and weathering—especially due to frost—clean, and reasonably binding but loose enough to permit of free drainage. Incidentally, the less dust and noise a ballast produces the better. It is difficult to generalise upon the suitability of various ballast materials other than broken stone, because conditions vary so greatly in different parts of the world, from Arctic cold to blistering heat, and from virtually no rainfall to 400 in. a year. The material suitable in one country or district will not necessarily give the best results in others.

Crushed stone such as granite, quartzite, igneous rock, or trap, has the advantage of being very hard and angular, and even broken limestone and sandstone may also be reasonably hard. As well as these crushed stones, gravel is used in the United States of America on some high-speed and on many other important lines there and elsewhere. It is comparatively cheap in most districts, but it lacks angularity and the property of binding, and though hard and porous, it cannot easily be kept in place.

Though extensively used in the United States, crushed slag is not so widely available elsewhere. It has the characteristics of rock, but it induces dry rot in wooden sleepers. Shell ballast also is commoner in America than elsewhere and, though it is not used now, burnt clay ballast was formerly found in some of the Southern States. In countries like India and Pakistan, where there are vast areas far remote from any stone, shingle and slag, jhama or overburnt brick provides a fair substitute for harder material, especially in metre- and narrow-gauge and secondary 5-ft. 6-in gauge lines. If it is carefully selected as thoroughly overburnt, it is reasonably hard and secures good drainage —an important asset during the monsoons—but it is light in weight and in time becomes pulverised under traffic. This lightness makes for relative instability in the track, and thus encourages any tendency towards corrugation and "roaring" in the rails because it fails to damp vibration.

Where there is steam motive power, cinders or ashes are the cheapest form of ballast, except possibly sand in certain areas, or earth. They provide good drainage, but powder and cake too easily for other than yard or unimportant branches. Cinders are, however, most useful as sub-ballast and for repair works in times of floods and slips. Their greatest fault is that they quickly corrode the feet of rails and steel sleepers in contact with them. Sand, as well as being cheap, makes a stable lower ballast, but when used for boxing, it is liable to be blown away and causes uncomfortably dusty though quiet travelling. To keep sand boxing in place grass is usually allowed to grow in it, but this tends to affect drainage, which is otherwise good in clean sand ballast. To provide a quick run-off for rain falling on sand-ballasted tracks, the surface of the boxing is often given transverse slopes from a central longitudinal ridge above top-of-sleeper level. Another method of drainage is to leave saucer-like depressions between every third or fourth sleeper and the next, with outlets alternately left and right.

The sizes normally specified for broken ballast are ¾-2½ in. or ¾-2 in. if stone. Up to 3½ in. is permitted in some cases in America; for shovel packing ¼-½ in. is usual. The depth of ballast under the sleepers varies in different countries and under different conditions from 6-12 in.; in the United States 12 in. of sub-ballast is also standard practice. The Americans slope their ballast away from the ends of the sleepers instead of a foot or so being laid level with the sleepers before the slope begins. In some tropical countries wooden sleepers are covered with a thin layer of ballast to protect them from being burnt by ashes dropped by locomotives. In the United Kingdom and in temperate climes generally, ballast level is kept about 1 in. below foot of rail. For track laid with cast-iron pot or plate sleepers having steel tie-bars between the pots or plates, a continuous longitudinal trough is formed in the ballast along the centre of the track, to ensure that the centres of the tie-bars do not rest on and become forced upwards by the ballast, thus causing a spread in the gauge. Such troughs are also sometimes used to prevent centre-binding with wooden sleepers. After careful packing, the next most important duty in maintaining any kind of ballast is to ensure that it is and remains clean, otherwise it loses its effectiveness. In some countries, including Great Britain, various machines are now used to remove from, clean, and return to the track the ballast in service and under traffic.

Punctuality

(*By a correspondent*)

THERE has been a considerable improvement in British passenger train timekeeping recently, except at weekends, but there is no room as yet for any complacency. The latest punctuality statistics, published in the August issue of the *British Railways Magazine*, show only 55.7 of steam and 69.8 per cent of electric express trains arriving to time, and 79 and 90 per cent. respectively arriving within 5 min. of booked time; if all trains were included, the figures were 80.7 and 87.3 per cent respectively. These were for the four weeks ended May 22, which included no Bank Holiday or other period of special pressure. The figures for the next month or two, when available, very likely will show an improvement, but a seasonal improvement might be expected in summer as opposed to winter, with its more severe weather.

On most British main lines the track in general has recovered from wartime arrears of maintenance, and the causes of lost time must be looked for mainly in other directions. Briefly, these are: (1) condition of locomotives; (2) locomotive handling; (3) station working; (4) traffic regulation by signalmen and control offices, and (5) timetable arrangement. Today the condition of locomotives is responsible for far more delay to trains than work on the track. Scarcely a day passes without one or more locomotive failures, and when these occur on a busy main line, they can have far-reaching effects. From time to time, also, locomotives leave their sheds in such a condition that even the most competent crews could hardly hope to keep time with them. With the density of traffic over British main lines, it needs but one train losing time to cause the late running of a great number of others.

In locomotive handling, the almost unfettered discretion which is given to British drivers in the matter of timekeeping is probably unique. Many engine crews, probably most, show much praiseworthy energy and enterprise in trying to recover lost time; but there is a minority which make it a principle to regain little or no time that has been lost by circumstances not under their own control, and they are within their rights if they act accordingly. A few of the latter can undo the efforts of those who do try. Even some engine sheds seem to have their individual timekeeping traditions, some of them invariably good, and others indifferent.

If the time recovery bonus which makes timekeeping specially worth while to French engine crews is not practicable in this country, much might be done by arousing the spirit of competition. Before the war the *L.M.S.R. Magazine* used to publish brief details of meritorious performances by individual engine crews; is not something of

the same kind permissible today? And why not some published details of the timekeeping records of different sheds? As to operation in general, the published punctuality percentages of British Railways ought to be divided up into Regional averages, for prestige reasons. Competition and publicity to promote better timekeeping is worthwhile.

The part played by signalling in timekeeping is of paramount importance. Control offices often are blamed for unpunctuality, but except in cases where accident or breakdown has caused much dislocation, the part played by control in passenger operation in general tends to be small; the primary responsibility for regulation rests with signalmen. One of the main causes of delay to passenger trains is the tardy movement of slow unbraked goods trains ahead of them until the goods can be run into loops or sidings. Such movements usually are regulated on the basis of predetermined margins in front of the passenger trains, but these margins make no allowance for the possibility of the express train driver doing his utmost to recover time.

Any regular traveller has frequent experience of delays of this kind, which can be most discouraging to keen passenger engine crews. Many could be avoided if signalmen, before passing freight trains on to main running lines, were to make more use of their telephones to ascertain if passenger trains actually are regaining time since they passed their last previous reporting point. As two Regions now include in their working timetables instructions to their drivers to recover lost time whenever possible, with due observance of specified speed restrictions, every effort ought to be made on the operating side to see that they get the chance of doing so.

On the vexed question of recovery margins in train schedules there is no uniformity of practice on British Railways or even in individual Regions. The Eastern and North Eastern Regions show them in profusion over the East Coast main line between Kings Cross and Berwick, whereas in the Eastern Section of that Region there are scarcely any; on the Western Region they are laid down in large numbers, but in the Southern Region they are unknown. While there is some justification for allowing a train a small margin for recovering lost time on the final stage of its run, the insertion of such margins over various intermediate stages of its journey is of more debatable value from the timekeeping point of view, especially if the point-to-point times over adjacent stretches of line have to be cut to unreasonably fine limits to permit the insertion to be made.

If the up "Bristolian" of the Western Region is running to time, for example, it is hardly reasonable to expect the driver to average no more than 67.5 m.p.h. over the high speed stretch from Swindon to Steventon, because of the 4 min. recovery margin allowed here, and then to attempt an impossible 102 m.p.h. over the next stage, from Steventon to Didcot. Yet if he maintains an even speed throughout, his train may be up to 4 min. out of its booked path through such busy junctions as Didcot and Reading.

Such examples could be multiplied indefinitely in both the Western and Eastern Regions. Loss of time at stations was mentioned earlier, and can be caused in ways too numerous to describe. Timekeeping is of such importance to efficient railway operation that it demands searching examination, with a view to securing some substantial improvement in present conditions. Before the war, the L.M.S.R. achieved no small success with its "On Time" campaign. Why cannot something of the same sort be instituted today on a country-wide basis?

LETTERS TO THE EDITOR

(The Editor is not responsible for opinions of correspondents)

Freight Charges per Wagon-Mile

August 17

SIR,—For many years I have been convinced of the benefits which would accrue to all concerned, were railway undertakings to charge for the carriage of many types of freight traffic on the basis of so much per wagon-mile. In the first instance, it would seem that there would be substantial clerical economies. In addition, there would be such a strong inducement to better wagon loading that the average wagon load would undoubtedly be raised, with consequential lower operating costs per ton-mile.

But to my surprise I have so far failed to discover any instances in which this method of charging has been actually adopted on a permanent and substantial scale. May I therefore enquire whether any of your readers know of any such instances, and the circumstances in which they were introduced?

Yours faithfully,

GILBERT J. PONSONBY

23, Belvedere Grove, Wimbledon, S.W.19

U.S.A. Train Accelerations

August 21

SIR,—Any reference in your journal to improvements in American passenger train services seems to be followed, in the next issue, by a letter from Mr. R. Bell pointing out that the railway or railways concerned are losing money. It apparently does not occur to him that the loss might be on a considerably greater scale if the railways did nothing in the realm of increased comfort and speed to retain their long-distance passenger patronage against the constant menace of air and road competition, but still were compelled, as they certainly would be by the Interstate Commerce Commission, to keep their passenger services in operation. Moreover, what has happened recently in California shows that an individual State has the power to compel a railway to expend money on a considerable scale for the improvement of a passenger service which the railway itself regarded as adequate.

An astonishing sentence in Mr. Bell's letter in your August 13 issue is the last, to the effect that the only beneficiaries from train acceleration are the vendors of fuel and lubricant; on the other hand, he remarks that the speeding-up "may provide advertising material." It would be interesting to know how acceleration can provide material for advertisement unless the passengers themselves have some interest in speed, and regard themselves as standing to benefit by it. If not, why make any attempt to improve train services?

Yours faithfully,

CECIL J. ALLEN

72, Rowlands Avenue, Hatch End, Middlesex

Passenger Timetables and Rolling Stock

August 20

SIR,—The letter from Mr. P. W. B. Semmens in your issue of August 20, on the time taken by electric trains between Brighton and Hastings is of special interest to me.

I have several times asked railway officials the reason for not dividing the Hastings and Eastbourne portions of electric trains at Polegate, as was done in the days of steam haulage. The journeys to Eastbourne and Hastings would be much shortened and use could be made of the track from Polegate to Stone Cross Junction, which was electrified when the electrification project was decided on. At present there is one through train in the evening from Hastings to Polegate. I have never been given a good reason for this. Each train from or to Victoria has its usual complement of twelve coaches.

Yours faithfully,

H. G. B. STEPHENS

10, Northwood Avenue, Purley

THE SCRAP HEAP

Metaphysical

British railway staffs are finding it more and more difficult to keep up with current regulations. A recent holiday excursion directive contained these lines at the end of the printed form: "If these instructions are not received, station staff must communicate with their regional offices immediately." Send it by the Ghost Train!—*Milton Schulman in the "Sunday Express."*

Arabesque

The unfamiliar views reproduced below, of the combined engine and saloon built in 1862 at the Newcastle Works of Robert Stephenson & Company for the then Viceroy of Egypt, Said Pasha, for his own use, were sent us by a correspondent. They show the unit in the Permanent Railway Exhibition at Cairo Main Station.

A description kindly supplied by Robert Stephenson & Hawthorns Limited states that the locomotive, which bore the makers' number 1295, has 5 ft. dia. driving wheels and cylinders 9 in. dia. × 14 in. stroke. The inside of the carriage was luxuriously upholstered in silk, friezed with the Khedivial monogram, and the Crescent and Stars. The decorations were in black, white and gold, designed by Digby Wyatt, specialist in Arabic design, and the painting was done under his personal supervision. The dome, safety valve covers, lamps, handrail fittings, and so on, were all gilded. The outer form of the engine and carriage were, as nearly as could be, made to suit the decorations. There was a communicating door between the saloon and the footplate, so that His Highness could step out and drive himself; the regulator and reversing and other handles were of silver. When completed the engine was tested on the North Eastern Railway, and ran 22 miles in 21 min. start to stop.

An Admission

Our local stationmaster thinks that when I was young I used to travel in open railway carriages. I have tried to disabuse him of this idea, admitting at the same time that I can remember the time when pulling the communication cord was a much more notable achievement than it is today. Whether attacked by sudden illness or by an ill-disposed fellow-traveller you had to lower the window and reach for the cord that ran above it. Then, if all went well, it rang a gong on the tender; and then, if all went still better, the man on the footplate might hear and take appropriate action. Probably such misapprehensions spring from an exaggerated sense of the unity of history, the idea being that those who can remember one historical figure or incident should be able to remember from personal experience everything else in the history book.—*From "The Manchester Guardian."*

Locomotive Driving Licence

A clipping from the *Denver Post* which reached me a few days ago assured me that in Ireland "any person who has reached the age of 21 attests that he has a reasonable familiarity with things mechanical and is willing to pay $2·80 will be granted a licence to operate any mechanically propelled vehicles up to and including a locomotive." Here, I thought, was encouragement for anyone who had a mind to buy one of the U.T.A. locomotives which are coming under the auctioneer's hammer.

I put a call through to the local taxation office. Alas! the "locomotive" which can be driven on licence is a road locomotive—the type that road contractors use or that may be seen pulling a carnival—but not a railway locomotive. It seems that any vehicle which exceeds 7¼ tons requires a separate county council licence before it can be driven on the road, and no licensing authority is likely to issue one for a railway locomotive. However, there is never likely to be an application for one, though the removal of any of the railway locomotives on sale is a matter for the buyer—and they will only be allowed a certain time in which to do it.—*"The Roamer" in the "Belfast News-Letter."*

Bird of Passage

A hen which travelled on a locomotive for more than 20 miles from Kirkby Stephen, Westmorland, to Barnard Castle, Co. Durham, seemed little the worse for its experience. The bird apparently roosted on the engine, which stood at Kirkby Stephen overnight.—*From "The Times."*

Roses, Roses All the Way

A porter at Chesham railway station followed a trail of rose petals to a railway carriage. He found that a passenger had a bunch of roses which he had picked from the platform flower bed. At Chesham, where the story was told, the passenger was given a conditional discharge and ordered to pay £2 costs—*From the "Evening Standard."*

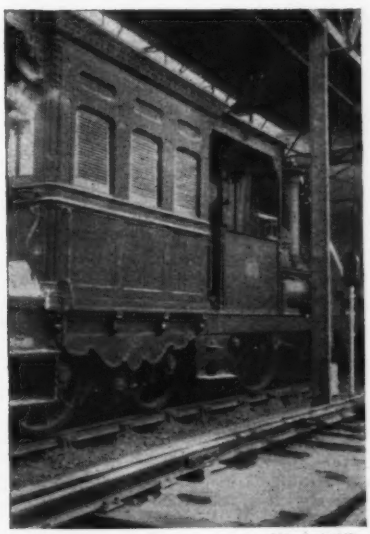
Otium cum Dignitate

A retired U.S.A. railway officer has sent us the following, which he describes as "doggerel—slightly autobiographical."

Bill Smith has now ended his
life-long career;
After years on *The* Railroad* he's
out on his ear.
On account of his age he was
forced to retire.
Now he sleeps many hours
in front of his fire;
And in summer he lies, quite
relaxed in the sun—
A restful existence, when all's
said and done . . .
When his instinct for sport
irresistibly calls,
He goes out with the boys to
chase little white balls.
He can scratch in the garden
that's in his front yard,
But he's careful to stop when
he thinks it's too hard.
So he says, by and large, that
he leads a dog's life:
Albeit it's true he has only
one wife.

S.W.

*N.Y.N.H. & H.RR.—ED., *R.G.*



Photos] [H. J. Griffin

Combined engine and Khedivial saloon in the Permanent Railway Exhibition, Cairo. The coachwork is much less ornate than as originally built

OVERSEAS RAILWAY AFFAIRS

(From our correspondents)

VICTORIA

Suburban Works

The second track on the Riversdale-Ashburton section of the Camberwell-Ashburton line is expected to be in operation by September, but the more difficult section, between Camberwell and Riversdale, which includes the flyover to carry down Ashburton line trains over the Box Hill lines, is not expected to be completed until late next year. All retaining walls, earthworks and bridges for extra tracks on the Richmond-South Yarra section are finished. Four of the six tracks are in their new positions, and work on the others is in hand. Work is also in progress on improved crossing facilities at Macleod on the Eltham line. It involves a second platform and interlocked points and signals operated from a new signal cabin on the platform. These will reduce greatly the time taken to cross trains, give a more frequent train service on the Heidelberg to Eltham single line section, and improve the time-keeping of trains.

INDIA

New Stations

Sixty-six additional stations were opened during the year 1953-54. They consist of 29 stations, 25 flag stations and 12 halts. In 1952-53 the total was 57 stations, 35 ordinary stations, 15 flag stations and seven halts.

Chunar-Robertsgunj Line Opened

The Chunar-Robertsgunj line of the Northern Railway is now open to traffic. It takes off from Chunar, near Moghalsarai, and is 50 miles long. Construction began about three years ago, mainly to help development of the Uttar Pradesh Government's cement factory at Churk, near Robertsgunj (Mirzapur district). The line will help the transport of construction materials for the Rihand Dam Project and also open up undeveloped areas in the southern parts of Mirzapur.

The branch is estimated to have cost Rs. 25,000,000. About half the line lies in the Gangetic Plain and the other half along a plateau in the Vindhyas, some 600 ft. above sea level. The alignment allows the line to be extended by another 12 miles to Pipri to serve the requirements of the Rihand Dam.

Time Interval System in Emergencies

When heavy rain coincides with high tide parts of the Western and Central Railway lines in the Bombay area become flooded. As all the suburban area is controlled by track circuits and automatic signalling, the whole service becomes disorganised when these are affected by floods. Part of the track in the low-lying Kurla area has been lifted to obviate flooding but there are places where this cannot be done without heavy expenditure because of roads, bridges and other geographical difficulties.

Where there is dislocation of service as a result of the signalling being put out of action by flood water, it has been decided to run trains on a ten-minute interval basis.

To keep trains moving through flooded areas, the former B.B. & C.I. Railway introduced special signalling as far back as 1935-36. An emergency lever is provided in the signal cabins concerned which is locked by an Annetts key, kept in safe custody by the stationmaster. When floods cause a complete failure of track circuits, the stationmaster on authority from the traffic controller or other official, issues the key to unlock the emergency lever. The operation of this lever cuts out the track circuit control on the multi-aspect colour-light signals and they are controlled direct from the lever. The system operates under approved special instructions.

MOZAMBIQUE

New Line to Rhodesia

Rapid progress is being made with the construction of the new line to Rhodesia to meet that being built by the Rhodesia Railways from Bannockburn to the Southern Rhodesia-Mozambique border. A temporary bridge has been carried over the River Limpopo and trains are running between Lourenço Marques and Mabalane.

The bridge, 2,012 ft. long, has 66 piers built of 345 piles, 13 m. long. The piers form the support for 199 crossbeams of the Grey type, on which rests the platform consisting of wooden beams.

CANADA

New "Dome" Cars for C.P.R.

Canadians will enjoy the longest ride in the world in "dome" cars, by reason of the purchase of 173 streamline, stainless steel passenger cars by the Canadian Pacific Railway from the Budd Company.

The stock, intended for trans-Continental services, and to be formed into complete new trains, will be fitted with disc brakes which are much lighter than clasp brakes, have fewer component parts, and give much longer service. The saving in maintenance is expected to amount to about $24,000 a year on a 15-car train.

Music in C.P.R. Passenger Vehicles

The Canadian Pacific Railway for the first time in its history is providing passengers with music when they travel on the new C.P.R. "dome" cars now on display. All new C.P.R. passenger vehicles are to be equipped with wired music, connected with a public address system, over which train crew members will inform passengers on passing points of interest, and make various announcements.

Wired music will be controlled by the car attendant in each coach with individual rooms in the sleeping cars having their own controls and choice of two programmes.

UNITED STATES

Gallery Coaches for Southern Pacific

The opinions of San Francisco season-ticket holders on the comfort of the double-deck coach borrowed from the Chicago, Burlington & Quincy Railroad for trial on the San Francisco suburban lines have been so favourable that the Southern Pacific Railroad has ordered ten of these vehicles, at a cost of over $2,000,000. Upper deck passengers are accommodated in galleries on either side, running the full length of each car.

The equipment will include foam rubber seats, tinted windows, self-contained air-conditioning, zone heating, and foam rubber seats; it is expected to use diesel-electric locomotives on the new trains.

Electrification on the Great Northern

Over the 74 miles of its main line between Wenatchee and Skykomish, Washington, the Great Northern Railway for a good many years past has worked its trains by electric power. This section includes the Cascade Tunnel, the altitude of which, 2,168 ft., necessitates a climb of 2,170 ft. from Wenatchee and 1,885 ft. from Skykomish, by severe gradients.

This section is now to be made the subject of intensive study, to ascertain which of three possible alternatives is the most desirable from the point of view of economical working. The first is to eliminate straight electric working, and to operate all trains over this section with diesel-electric power throughout; a second is to cut the electrically-equipped section down to the $7\frac{1}{4}$-mile length of the Cascade tunnel; and the third is to extend the electrification westwards for 23 miles to Gold Bar, 52 miles to Everett, or 84 miles to Seattle.

New Wage Demands

The Brotherhood of Locomotive Firemen & Enginemen has announced that it will seek a wage increase of 28 cents an hour for all its members now working on a 40-hr. week basis, and for a minimum wage of $20 a day for drivers and $18 a day for firemen. These minimum wage figures were included in certain demands presented by the B.L.F. & E. a year ago, but not pressed when certain concessions were made under what was known as the "trainman package" agreement of last year.

The Brotherhood of Railway Train-

men is also advancing certain new claims. They are: payment of straight time when any of the seven national holidays falls on a working day, even though no service is performed; payment of time-and-a-half if any service is performed on such a day; and payment of time-and-a-half plus regular vacation pay if any service is performed during an assigned holiday period.

Various other demands include the payment of special premiums for road service on "excessively long and dangerous freight trains," which according to the B.R.T. president means any train in excess of 70 bogie wagons. As with modern diesel power trains of 100 wagons and more are common on a number of main lines, acceptance of this last demand might prove very expensive to the railways, offsetting much of the economic advantage derived from the substitution of diesel-electric for steam power.

FRANCE

Lyon-Vaise Steam Shed Closed

At one time Lyon-Vaise Depot was responsible for the operation of main-line passenger trains from Lyons to such points as Grenoble, Maçon and Saint-Germain-des-Fossés. With the transfer of this type of work to Vénissieux and Lyon-Mouche, Lyon-Vaise concentrated on work in the Lyon suburban area.

When the depot was rebuilt after the war, diesel railcars, operating from Lyon-Perrache, were becoming more important and steam traction began to decrease, this trend increasing with the electrification of the Paris-Lyons route. By August, 1952, the Lyon-Vaise steam depot was down to 120,000 km. (74,000 miles) per month, by January, 1953, to 90,000 km. (56,000 miles) and by January, 1954, to 45,000 km. (28,000 miles). At the end of the 1953-54 winter service, the depot was closed for steam traction and the remaining engines and work transferred to neighbouring sheds. Redundant staff were given the opportunity either of moving to other steam depots or of being trained as electric locomotive or diesel railcar drivers.

Modernisation of Baggage Vans

The Western Region is removing the wooden bodies from four-wheel passenger train vans built in 1924, and replacing them by steel bodies. The underframes are being retained and a new steel body fixed so that, with the underframe, one compact tubular unit is formed.

The body is made up of prefabricated sections assembled by the extensive use of welding. The ends are made of 6-mm. (0·236 in.) steel sheet, the sides of 3-mm. (0·118 in.) steel sheet and the roof of 1·5-mm. (0·059 in.) steel sheet; each of these is suitably reinforced at vulnerable points.

The conversion work is being carried out at the Saintes Workshops at the rate of one van every three days. In all, 93 vans are to be converted; the cost per van is fr. 3,400,000 (£3,400) compared with fr. 6,500,000 (£6,500) for a new van of similar design.

Illuminated Diagram at Paris-Austerlitz

An illuminated timetable diagram at Paris-Austerlitz includes a map showing the places served, with a keyboard, containing 111 buttons, below the map. The buttons correspond with the stations served from Austerlitz, and the pressing of any button immediately causes the usual route to the place in question to be illuminated on the map. Individual panels on each side contain the itineraries to the trains leaving Austerlitz, and above these panels are the numbers and departure times of certain trains; at the same time as the route is illuminated the appropriate train numbers and departure times are lit up in this top section. After selecting the train he needs, the passenger is able to consult the detailed itinerary in the side panels.

Publications Received

N.W.R. of Pakistan Travel Literature.—The Public Relations Department of the North Western Railway of Pakistan, in certain cases in conjunction with regional authorities, has issued well-produced folders on Lahore, Abbotabad, Swat State, and districts and towns served by the system. The folders contain much useful railway travel and other information, with well chosen and well reproduced photographs and attractive coloured covers. Whilst the beauty of the scenery and variety of places of interest and of recreations in these regions are world-famous, many people will be surprised at the completeness of the tourist facilities available today.

The Master Engineers. By Emmeline Garnett. London: Hodder & Stoughton, Ltd., Warwick Square, E.C.4. 7¾ in. × 5¼ in. 223 pp. Illustrated. Price 12s. 6d.—This book is a companion to "The Railway Builders," a biography of the Stephensons by the same authoress. The "master engineers" are the Brunels, Marc Isambard the father, and Isambard Kingdom the son, whose life histories are here described, but there are also a good pen picture of Daniel Gooch—Isambard's mechanical associate—and many references to the Stephensons. The details of and hair-raising episodes in the epic construction of Marc's masterpiece, the Thames Tunnel, make thrilling reading. Isambard preferred, of his own work, the one which made his reputation, the Clifton Suspension bridge, begun in 1836 when he was 30, but of greater interest to railway readers are the descriptions of the "railway mania" and of the construction of the Great Western and its associated railways by him, culminating in his masterpiece, the Royal Albert bridge at Saltash. None of his successes is overlooked, but nor are his failures, such as the atmospheric railway and the *Great Eastern*. The book is racily written and the pen-drawing illustrations by Wardill are excellent.

Les Buffets de Gare-1954.—This small folder in French and English issued by the French National Railways gives a list of station buffets with the price of the *menu touristique* and *autour d'un plat* meals served in each. The composition of these meals is indicated, as also are table reservation facilities for S.N.C.F. passengers. A schematic map of principal railway routes in France shows some of the regional gastronomic specialities. The motif of the coloured cover combines the record-breaking South-Eastern Region electric locomotive No. 7121, and a chef's cap.

Follow the Sun to the South this Autumn.—This leaflet, issued by Thos. Cook & Son Ltd., lists a number of coach tours abroad designed for those who take their holidays in the autumn. Travel from London is by rail and sea to a suitable point where the coaches are joined. One tour takes passengers along the Rivieras to Rome, Florence, Venice, Montreux, Autun, and Paris. There is also a tour of Spain, visiting the major cities, and a number of other tours through Europe. Four tours described are combined with a week's stay at one point.

Morgan Refractories.—A series of illustrated leaflets issued by the Morgan Crucible Co. Ltd. gives details of several types of refractory bricks manufactured by the firm. Type M.I.23 can be used as a direct furnace lining up to 1,260°C. where furnace conditions are clean. M.I.28 is a hot face, low heat-storage, insulating refractory, which can be used at furnace or interface temperatures up to 1,538°C., and type M.R.I can be used at temperatures up to 1,600°C., and which is said to be beyond the capacity of other refractories of similar alumina content

Training of Engineering Graduates.—Details of schemes available for post-graduate training of final year engineering students of universities and senior technical colleges both in this country and overseas, are outlined in an illustrated booklet, The Training of the Professional Engineer; issued by the Metropolitan-Vickers Electrical Co. Ltd. Training courses are also available for trade apprenticeships available for boys from secondary, technical, grammar, and other schools. Full details of the courses available and conditions of service, rates of pay and so on, can be obtained on application to the Metropolitan-Vickers Electrical Co. Ltd., Trafford Park, Manchester, 17.

A Paradox of Modern Railway Management—2*

"Efficiency" in terms of operating statistics, in relation to goods traffic

By A. R. G. Saunders, B.Com.
Acting General Manager, Sierra Leone Railway

IN the first part of this article the writer argued that the prosperity of a railway was independent of "efficiency" in terms of railway operating statistics and that a pre-occupation with "efficiency" inhibited the expansion of railway business to the detriment not only of the railway but of the territory in which it operated. The point was also made that Government ownership of a railway fostered a pre-occupation with efficiency. It is now the intention to enlarge on these arguments in relation to goods traffic.

It has been universally held that costing on a railway is extremely difficult if not impossible. Actually it is quite easy, rather like the calculus, once the knack has been discovered. It is sufficient to say here that it is easy to show that on the Sierra Leone Railway the cost of carrying goods per ton-mile is one halfpenny.

This cost does not vary with the distance that goods are carried, despite what all the text books say, and the figure is the same for almost all traffics. For all practical purposes it is constant and is accurate, though the apparent convenience of the amount might make it seem otherwise. On railways of wider gauge the cost is much lower, as low as one-eighth-of-a-penny per ton-mile, or even smaller.

If a railway could charge one-halfpenny or even three farthings a ton-mile, then there would be little or no road competition. Unfortunately railways cannot generally charge such low rates, as revenue must cover not only the actual operating costs but also the very large burden of fixed costs. If there were a sufficient volume of traffic, then a rate of, say, five-eighths-of-a-penny per ton-mile is quite within feasible limits.

Rate Fixing

To earn the maximum possible revenue rates have to be high enough to cover the fixed costs and yet not so high as will diminish the demand for transport; the demand for transport, both by rail and road is of course a function of the rate. A commodity priced at £2 a ton can bear but very small transport costs compared with a commodity priced at £20 a ton. To maximise revenue it will clearly pay to quote a low rate for the low valued commodity and a high rate for the high valued commodity. The upper limit to rates will be set by the competitive rates by road transport. This differential system of railway rating is the traditional "charging what the traffic will bear."

On the Sierra Leone Railway the actual rates in operation vary through a whole range of prices from 1½d. to 9½d. a ton-mile. A wagon containing only two tons of goods at 9½d. per ton-mile, will produce more revenue, both gross and net, than a wagon containing 12 tons of goods at 1½d. a ton-mile. The prosperity of a railway is determined therefore, not by the weight of goods conveyed in each wagon, nor by the weight of goods hauled by each engine, but simply by the kind of goods that are carried, by the rates that are charged, and by the demand.

Prosperity is quite independent of efficiency as measured by the average wagonload, the average trainload, the trailing ton-miles per engine-hour and so on. Moreover, if it were possible to increase efficiency and so to reduce the ton-mile cost then a saving on a figure as low as one-halfpenny would be infinitesimal compared with a loss of traffic carried at 9½d., or 6d., or even 1½d. per ton-mile.

The operating statistics do not discriminate between a ton of silk goods and a ton of iron ore, they do not discriminate between goods carried at 9½d. a ton-mile and goods carried at 1½d. a ton-mile, but from the point of view of technical efficiency 12 tons of iron ore in a wagon is to be preferred to two tons of silk goods, as the former gives a higher weight/capacity ratio than the latter.

Efficiency Unlimited

The agricultural produce of any country is seasonal. This creates a busy season and a slack season and during the busy season one would expect an all-out effort to be made to cope with the seasonal demand, to get as large a share of the traffic as possible.

It is a surprise, therefore, to read the following in a recent authoritative book* on how railways should be managed in the tropics:—

> "Favourable traffic figures can easily be discounted by heavy locomotive costs. Where the traffic department controls the motive power, there is a natural tendency to draw an engine from shops, flog it over the line, return it to shops and draw another. This may be costly. It may pre-dispose to engine failures and defeat its object by calling for an excess of locomotive power. With the best will in the world, an overriding traffic control over motive power can easily run up a locomotive repair bill."

The writer recommends, therefore: "For efficient and economical operation, locomotives should move with rhythm hauling trains within their normal power."

This recommendation is the very antithesis of an all-out effort to secure more traffic in a busy season. According to this policy the locomotives are to be worked carefully and rhythmically to keep costs down. In the passage quoted there is no reference to the differential rates structure of a railway, no recognition of the obvious fact that costs are far more easily covered if a rate on traffic is 3d. instead of 1½d. a ton-mile.

These quotations are not isolated passages taken unreasonably out of their context. There are similar passages which show that the intention is and was to subordinate traffic requirements to cost.

In arriving at the cost of one-halfpenny a ton-mile, the cost of locomotive repairs was included. The cost of such repairs amounts to 0·07d. per ton-mile. Compared with the ton-mile operating cost, this cost is quite small; compared with the lowest rate of 1½d. a ton-mile the figure is minute; compared with a rate of 6d. a ton-mile it is infinitesimal.

If the cost of engine repairs were doubled or trebled, even, there is not the remotest possibility of the increased costs discounting favourable traffic figures, even if the traffic were carried at the lowest rate.

The cost of engine repairs will rise if engines are worked under pressure and more intensively, but it is quite impossible for the cost of increased engine repairs to discount favourable traffic figures.

State Control of Expenditure

If however, one considers the case of a Government-owned railway, where the expenditure is controlled by the legislature, then it is possible to understand what the writer actually meant. He was thinking in terms of the total repair bill, the total expenditure on engine repairs, an amount which is fixed in amount, for the year, by the legislature.

If that expenditure were doubled, then, to put it mildly, the fat would be in the fire, whatever the justification. No expenditure can be incurred in excess of that already fixed, without the

*Part 1 appeared in our issue of August 20, 1954

* "Transport Administration in Tropical Dependencies" by G. V. O. Bulkeley in collaboration with E. J. Smith. London: *The Railway Gazette*, 1946

prior consent of the legislature. If it were so incurred, then, apart from the breach of regulations, an obvious criticism of extravagance or inefficiency would lie. In fact there would be obvious inefficiency as the cost of repairs per mile would rise, a sign of inefficient administration.

The sums involved are large. The actual size will depend on the size of the railway, but a figure of £250,000 might well be involved, on a large railway.

If the expenditure were irregularly incurred without previous approval, then to justify it, one would have to argue that efficiency has no bearing on a railway's prosperity and this would be to argue a point which is manifestly absurd. Once the year's expenditure has been approved, then, through the medium of the accounting procedure of a Government department, all efforts are concentrated on keeping within the set limits and the whole business is subordinated to expenditure.

Demand in such cases ceases to have any importance whatsoever. The amount of money available alone is of significance and this must be spent as economically as possible. Technical efficiency therefore becomes paramount and commercial efficiency is subordinated to it. The statistics of operation assume a singular significance and become the gauge of management.

If demand is ignored, one must not be surprised at accumulations of unsatisfied demand. On the Sierra Leone Railway, the rise in goods revenue between 1950 and 1952 was solely the result of relaxing the drive for "efficiency." Accumulation of demand has occurred in Sierra Leone; piles of produce await transport to the port for export.

"Efficiency" is a catchword of respectability. To argue in favour of less "efficiency" is not merely to be heretical; it is to be eccentric.

(To be continued)

South African Railways Steam-Heating Tenders

Electric train heating by automatic oil-burning plant

AN improved type of steam-heating tender for electric main line trains has been brought into use on the Cape Western and Natal systems of South African Railways. The new tenders are fitted with automatic oil-burning generators and are stated to be both cleaner and more effective than the former coal-burning type. A total of 16 tenders is being built, of which 11 are already running. It is intended that eventually nine will be used on the Cape Western system and the remaining seven in Natal.

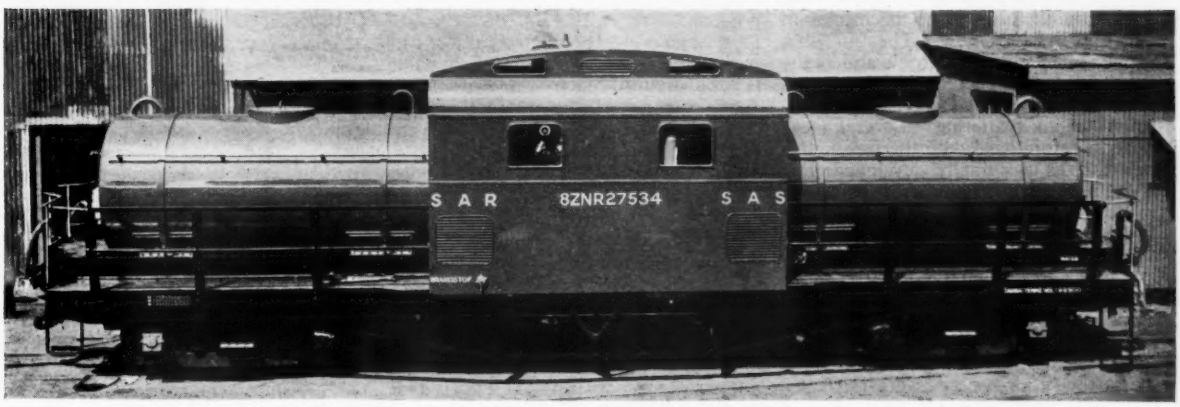
The winter season, for train-heating purposes, lasts from May to October, during which period the tenders are in daily use on passenger trains. The tenders are in use at present between Pietermaritzburg and Volksrust, Glencoe and Harrismith.

Of the original coal-burning steam-heating vans, which were converted to that use in 1930, six are still in service in Natal.

Use on Cape Western System

The nine tenders allocated to the Cape Western system will work between Cape Town, Worcester, and Touwsrivier later in the year when the passenger trains are taken over by the recently-acquired Class "4-E" electric locomotives.

The distance between Cape Town and Touwsrivier is 160 miles, and the running times of the present fast and ordinary passenger trains worked by steam locomotives are 5 hr. 44 min. and 6 hr. 27 min., respectively. Journeys on the Natal system on which these tenders are used vary from 6 hr. 55 min. to 13 hr. 6 min., the longest daily return journey, between Pietermaritzburg and Volksrust, taking 21 hr. 33 min.



Steam-heating tender for use on the electrified main lines of the South African Railways

ALUMINIUM DEVELOPMENT ASSOCIATION AND THE C.I.D.A.—At a recent meeting of the Council of the Aluminium Development Association it was decided that an invitation should be accepted to join the Centre International de Développement de l'Aluminium. The C.I.D.A. was set up some three years ago at the suggestion of the O.E.E.C., and it is composed of five countries at present: France, Italy, Switzerland, Germany, and Austria. The aim is to further the development of aluminium by discussing problems of common interest among the participating organisations. The C.I.D.A. secretariat is in Paris, at the offices of l'Aluminium Français, under a governing committee, the chairman of which is Monsieur Dumas of the same organisation. The work has been carried forward through five committees established in 1951, on architecture, transport, chemical applications, electrical engineering, and publicity. It is understood that a standards committee was set up recently.

New Method of Pointing Brick Lined Tunnels—2*

Aerocem process: pointing technique: rates of pointing

IN the Aerocem process the mortar prepared in the patent mixer is transferred to a pressure pot, which consists of a stout metal container of 2 cu. ft. capacity having a delivery tube to a gun at its base and an easily removable pressure tight lid and diaphragm at its top. A pressure regulator, gauge, and air taps are incorporated in the lid, which is connected by air line to the compressor. The magnitude of the controllable air pressure regulates the rate of delivery of the foamed grout to the gun.

The gun receives an auxiliary air supply direct from the compressor and it is so arranged that this auxiliary air escapes through an annulus surrounding the mortar thus mixing, accelerating and containing it. The auxiliary air supply at the gun is controlled by a suitable tap and by varying this air, the nature of the extrusion can be changed from a smooth stream to a spray with increasing pressure.

The rate of the material issuing from the gun is controlled at the pressure pot and it should be kept at the minimum which will cause flow. The gun first supplied had a circular nozzle and annulus and it was found that it was almost impossible to use it for pointing brickwork due to spattering. Several ideas were therefore tried with the firm and a new nozzle was finally developed; this is 2 in. long, $\frac{1}{4}$ in. approx. rectangular in section and with the outer casing forming the annulus slightly extended and somewhat curved so that the containing action of the auxiliary air is more pronounced: spattering of the brickwork can thus be completely eliminated and provided the gun is kept within $\frac{1}{4}$-$\frac{1}{2}$ in. of the brick joint, an increase in the auxiliary air produces greater penetration by the mortar.

The compressor is a twin cylinder piston-type, capable of maintaining 100 p.s.i. for 30 cu. ft./min. It is driven by a 10 h.p. Petters petrol engine and is mounted on a mobile chassis.

The following is a brief outline of the procedure found desirable to give the maximum benefit from the process.

Wagon Arrangement

The wagons should be low-sided. Some variation in this arrangement might be made combining wagons "B" and "C" into a long wagon. Wagons "A," "B" and "C" are kept coupled as a unit, the supply pipes to the gun coming from the further end of wagon "C." The equipment is cleaned and checked on the day prior to use and fastened securely in the wagon. Two guns, one per pressure pot, may be used to increase output, in which case it is found desirable to take the secondary air supply from the attachment provided on the pressure pot lid. The section of brickwork to be pointed is previously washed clean, but if this is not possible a two-chain start of clean brickwork should be available (especially if two guns are working) to avoid interference between the pointing and washing down gangs.

Materials

The sand must be rounded, washed, natural medium to fine well graded sand with 100 per cent passing through the No. 25 B.S. Sieve and conforming, if possible, to the Fine limit of the B.S.S. for mortar sand for plain brickwork or masonry. The only deviation permissible is for a rounded material finer than this. A representative sample of the sand to be used should first be secured from the suppliers and a sieve analysis obtained. The sand is kept in wagon "A." It may either be pre-sieved and bagged or sieved at the end of Wagon "B" adjacent to Wagon "C" via an $\frac{1}{8}$ in. mesh sieve to remove occasional large particles. Cement must be kept dry and free from lumps and can be carried from further along the train. The cement is kept in wagon "B" until actually used. Two four-gallon cans of Teepol per unit of wagons per day will suffice. This is kept in wagon "C."

A collapsible trestle staging, some 15 ft. in length and 4 ft. high, capable of supporting safely two men, should be available to allow pointing of the side walls above head height. This can be kept for transportation in wagon "B." Protective clothing or tunnel coats for operators is necessary.

Lighting units driven off a small portable generator are in wagon "B," and an open tank, 50 gallon approximately, of water, stands in wagon "C" and is replenished from the tender. Buckets are needed to transfer the mix to the pressure pots, and a spring balance is required to control quantities of mix ingredients.

The question of mix ingredients is always under review depending upon the desired properties of mixing, gun application, finished product, and so on, and, most important, upon the necessity to remove as much skill as possible from the actual preparation of the mix. To this end a suitable sand to be used throughout the Region has been selected and exhaustive tests performed, showing, that apart from the grading of the sand, its moisture content is a vital figure in preparing a stable mix, these two figures however being related. From the tests a nomogram was prepared correlating the amount of sand and water to be added to a given amount of dry cement and foaming agent, knowing the moisture content of the sand. Thus for the 4 cu. ft. mixer, at a sand moisture content of 5 per cent, the mix would consist of 80 lb. cement, 165 lb. sand, 32 pints water, and 20 oz. (fl.) Teepol "410." The mixing time is six minutes.

Although the sand chosen has high stability, allowing some moisture variation, the limits of water content of the mix are still close. A water estimator to check error has been developed since those normally marketed do not cater for a fines fraction in the sand to the accuracy required. The estimator uses the principle of altering the specific gravity of a water miscible spirit by adding wet sand to it. Quantities are controlled in the apparatus, and hydrometer readings, when applied to a nomogram calibrated for this sand, give the moisture content to within 1 per cent accuracy. This water check is carried out only a few times throughout the shift at the discretion of the supervisor; a heavy mist rolling through a tunnel has been known to raise the moisture content of a wagon of sand from 6 per cent to 8 per cent within the space of two hours.

Preparation of Mix

The mixing should be under the control of a skilled operator. Water and foaming agent (Teepol) is placed in the mixer and foamed until all

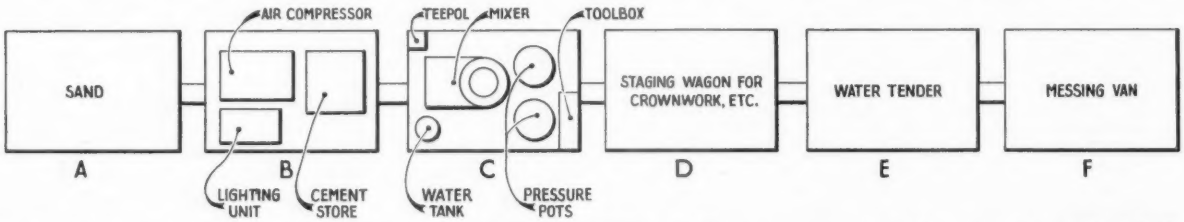


Diagram showing order in which wagons of pointing train are marshalled. Wagons B and C may be combined if necessary as one long wagon

* Part I appeared in our issue of August 20, 1954

liquid becomes foam of the desired volume and consistency. The cement is fed into the mix uniformly, so that the aeration decreases by "killing" the larger and therefore less stable bubbles. Sand is added gradually, the foam never being allowed to subside completely. The motor speed must be varied to prevent excess aeration during the addition of cement and to maintain a vortex action throughout the whole time of mixing.

These cases apply to overhead as well as side wall pointing, it being generally necessary to increase the auxiliary air pressure slightly in the former case. Where wet brickwork is such that it would tax even a bricklayer trowelling, it has been found possible to spray the joint and allow to set forming a key upon which a second application may be made during the next tunnel occupation. The face of the brickwork should never be covered. The supervisor should arrange to move the wagons to keep up with the rate of pointing, since it is undesirable to stop the gun until the pot is empty. Deployment of gun operators, if there are two from the same wagon, needs organisation to ensure a continuous site for each to work at.

Pointing gun in use, showing the lever which regulates the auxiliary air supply surrounding and controlling the mortar flow

Staff Required

One skilled operator controlling the air compressor, mixer, and pressure pots, and supervising the mix, is required. This man, once trained, should accompany the equipment. There should be one gun operator, trained locally on the particular job, for each gun (of which there are either one or two), and one bricklayer following and cleaning the brick faces. He will only be required for part of the time, very little, if any, on dry walls. There should also be two men fetching cement and water, and shovelling sand which is transferred to the mixer by bucket, and one mechanic. Operations should cease in time for the equipment to be cleaned down before work finishes. The belt drive on the mixer should be tightened before use and slackened off after each day's work.

Using the equipment as indicated, rates of pointing of 30 sq. yd. of brickwork per gun per hour may be attained although a somewhat lower figure than this obtains for the daily average, mainly due to operator fatigue; in this connection more pliable and lighter hosing is desirable but no useful alternative has so far been found to natural rubber.

The equipment has been tried so far on three Districts in four tunnels, including the Severn Tunnel, and six sets are available on the Region. Twenty operators have been trained in its use, and site work has shown that this training, especially regarding the method of mixing, is essential. A number of details where improvements are possible are under review, e.g., a different type of nozzle. Further experimental work is in hand due to the marketing of a new foam stabiliser which it is claimed will give still greater latitude in materials and the method of operation.

After all ingredients have been absorbed into the mix, the material is aerated for the specified mixing time (six minutes) when the desired consistency of "whipped cream" will be obtained, no dry ingredients being evident. It should be agitated right up to the time that it is transferred to the pressure pot in order to obviate any tendency to settle out, but it should not be left mixing much longer than the stated mixing time since the heat generated affects the stability of the suspension.

General view of pointing train. One of the pressure pots can be seen on the right with lid removed for refilling

Pointing Technique

The pointing technique may be acquired by an intelligent worker, after training, once the principles have been explained. Basically the mortar is directed into the joint as it emanates from the gun, the secondary air pressure being used to enhance adhesion, if too high it will tend to spray and

blow the material out of the points. A low air pressure is required and the mortar delivery is controlled by signalling to the operator at the pot on wagon "C." The emergency shut-off at the gun should not be used to control the mortar flow as stoppage is likely to result. Gun stoppages may be relieved by thrusting a thin (⅛ in. dia.) metal rod down into the nozzle and withdrawing swiftly.

Generally, for dry brickwork and deep joints, low secondary air pressure is required (otherwise material is blown out of the joints), and high pot pressure. For dry brickwork and shallow joints, low secondary air pressure and low pot pressure results in good placing without overflowing too much around the joints. For wet brickwork and deep joints two methods may be used depending upon the difficulty encountered. For most cases the following suffices; high secondary air pressure to ensure adhesion by the slight spraying effect, with (relatively) high pot pressure to allow building up in the joint behind the jet as it moves along; the nozzle should be held a good distance (2 in.) from the brick. For the most severe cases an initial spray holding the gun close, with high air pressure to ensure adhesion at the bottom of the joint followed by a second application holding the gun at a good distance from the brick is most effective. With wet brickwork and shallow joints medium secondary air pressure and low pot pressure is used, so that the extrusion is almost a spray, holding the nozzle 2 in. from the brickwork.

(Concluded)

Aluminium Roof for Covered Vans

Sheets secured by extruded sections

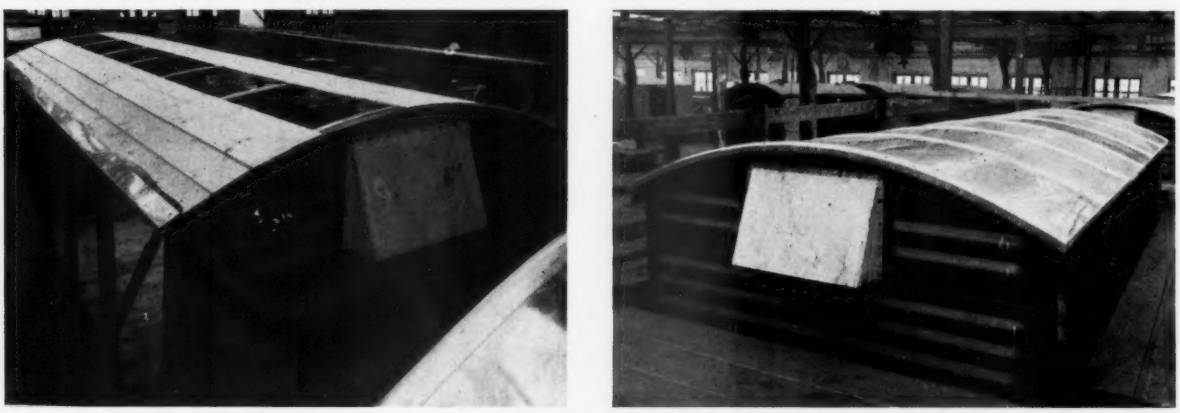
THE problem of maintaining the roofs of covered goods wagons in a weatherproof condition has received considerable attention from railway authorities for many years, and much experimental work has been carried out by administrations, both in Britain and overseas. From the railway operating point of view it is probably true to say that the greater problem arises in overseas railways in tropical conditions, where a high degree of humidity, tropical rain, and sunshine create problems different from those in this country.

Among the materials which have been suggested is thin aluminium sheet, but a satisfactory method of securing has always presented a difficulty. Last year approaches were made to British Railways by Imperial Chemical Industries Limited (Metals Division), and the Northern Aluminium Co. Ltd. for a trial to be made with aluminium sheeting which would be held in position by clamping bars of extruded aluminium.

Initial Experiments

After initial experiments had been carried out on a mock-up, the project was sufficiently promising to warrant further trial and a decision was made to fit 100 covered goods vehicles, 50 with Imperial Chemical Industries material, and 50 with Northern Aluminium Co. Ltd. material. The work was carried out at Faverdale Works, North Eastern Region, British Railways. The accompanying illustrations show the method of construction.

In application the work was fairly simple, as the aluminium sheets were ordered to standard sizes, and sheared and folded as required in the railway workshop. The extruded clamping bars were ordered to the required length and no manipulation was necessary. The end verge plates are the only portion requiring a special tool, and in this case a simple forming tool had to be designed. Support to the thin aluminium sheeting is provided by ½ in. thick plain edge boards which are screwed to timber fillets, secured to the angle iron roof members.

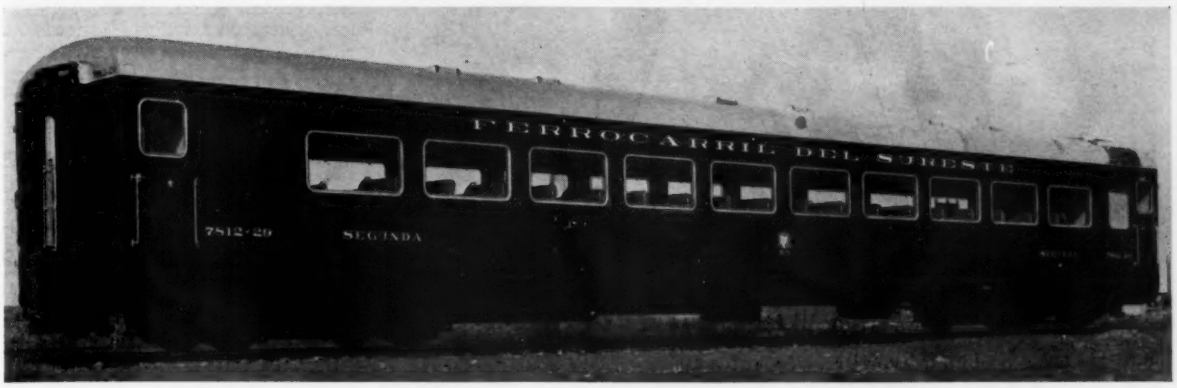


Roof assembly showing some of the roof boards in position and (right) the finished aluminium roof with extruded sections securing the sheeting

METROPOLITAN LINE RESIGNALLING.—London Transport Signal Engineering staff started work on August 9 on the first stage of a long-term plan to install electric colour-light signals on the Metropolitan Line from Rickmansworth to Stoke Mandeville, covering a distance of over 18 miles. The new system will replace the semaphore signals which have been in use since the line was opened over 60 years ago. The task of installing the new colour-light signals all the way from Rickmansworth to Stoke Mandeville will take several years to complete. Main-line express trains run to and from the Midlands and the North of England over this part of the line as well as steam-hauled Metropolitan trains to Aylesbury. A fresh stretch of line is to be dealt with each year. The first stage of the work covers nearly four miles of double track between Rickmansworth and Chorley Wood and will be finished by December. Eight semaphore arm signals will be taken out on this section and replaced by colour-light signals, which will be spaced differently to permit trains to follow each other at closer intervals. These new electric signals will be worked automatically by the trains, as on the rest of the London Transport railway system, but the signalbox at Chorley Wood will be retained for the time being for the working of goods trains in and out of the sidings. The Metropolitan Line on the London side of Rickmansworth already has colour-light signals.

Passenger Rolling Stock for Mexico

German-built vehicles to American constructional standards



Second class 53-ton coach for the south-eastern division of the Mexican National Railways

THE first large order for railway rolling stock placed by the Mexican Government with German builders after the war comprised a total of 48 bogie coaches, which are now in course of delivery from the new Salzgitter-Watenstedt works of Linke-Hoffmann Busch Waggon-Fahrzeug Maschinen G.m.b.H. This order was made up of 17 second class passenger carriages, 13 first class coaches for principal trains running up to 75 m.p.h., and 18 postal and express mail and parcels vans. The order was actually placed with Ferrostaal A.G.

None of this stock is to form fixed trains, but is to run over various main lines as required; but all coaches are built to A.A.R. standards in regard to buffing and drawgear and in general construction, and in the strength of the underframe to meet end loads of 800,000 lb. through centre couplers.

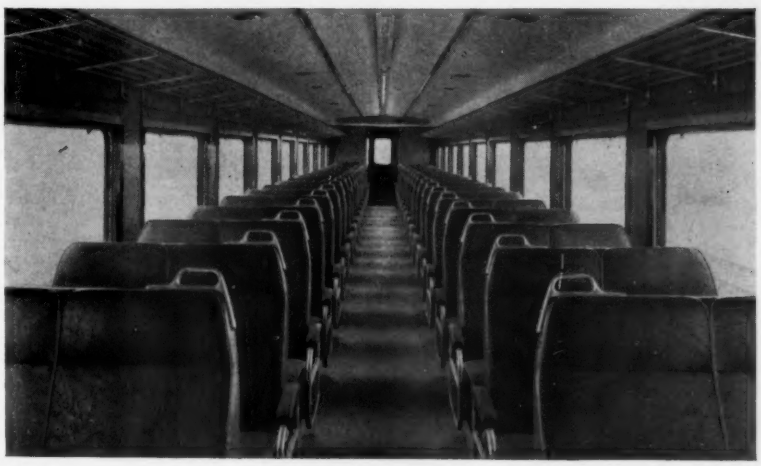
Both first and second class coaches have electro-mechanical air-conditioning equipment from the Safety Car Heating & Lighting Company, with a compressor directly driven by an electric motor, but with most of the remaining apparatus located in the car roof. In combination with this is a Vapor car heating system, and the two together permit an almost constant temperature inside the saloons whatever the outside temperature. Cooled and filtered air is admitted through ducting in the ceiling.

Welded Steel Construction

All-welded steel construction is applied to the body and underframing, and both inner and outer panel plates are of steel. In both first and second class cars the seats are in one long open saloon, with an interior finish in red or dark green with grey-blue lining in the first class cars, and with a light lacquer finish, as shown in the accompanying illustration, in the second class saloons. There is a toilet compartment at each end. Car lighting is by tubular lights down the centre of the ceiling. The two end doors on each side have balanced folding steps operated automatically with the door movement. Seats in the second class coaches have reversible backs.

All cars have the same general dimensions, being 84½ ft. long over buffers, 10 ft. wide over outer panel plates, 13 ft. 6 in. high, 9 ft. 10 in. bogie wheelbase, 59 ft. 2 in. bogie pivot pitch, and 53 tons tare weight. The bogies have independently sprung SKF roller-bearing axleboxes, with overhung laminated springs and helical auxiliaries. All cars have the Westinghouse high-speed passenger train brake, but arranged so that the vehicles can be coupled with stock having the older types of equipment.

Vestibule connection and door with folding steps, and A.A.R. centre coupler. On the roof is the grille covering air conditioning equipment



Interior of 80-seat second class saloon

London Transport Central Distribution Service

Ancillary road fleet of goods vehicles

Semi-articulated low-loading Bedford 8-tonner delivering a transformer to Baker Street substation

LONDON Transport operates a fleet of more than 450 goods vehicles. During the past five years strenuous efforts have been made to rationalise its operations. On the formation of the London Passenger Transport Board in 1933 the non-passenger-carrying road vehicles which were taken over continued to operate in separate units under the control of the employing departments during the whole of the lifetime of the Board.

It was not until the establishment of the London Transport Executive, nearly fifteen years later, that the possibilities of having one organisation to supervise the miscellaneous vehicle fleet were examined. As a result of the recommendations of a committee the Central Distribution Service came into being in October, 1949.

Through economies the fleet has been reduced to 160 and now comprises 40 7-ton and 47 5-ton lorries and vans, 12 30-cwt. vans, 7 15-20-cwt. vans, and 13 10-cwt. vans. In addition, there are 41 special vehicles, consisting of two semi-articulated low-loaders, one shelter-carrier, 18 tippers, 19 box vans for distributing food to staff canteens, and a 600-gal. tanker.

Extent of Services

Further economies have been effected by converting where possible old bus chassis for use as lorries. Among properties which are regularly served by the vehicles are 230 railway stations, 175 staff canteens, 113 garages and 20 railway depots, as well as works and offices, power-stations, substations and signal cabins.

Except for some special-purpose vehicles, the fleet is the responsibility of the Chief Supplies Officer, and is administered through a superintendent from a control office in Chiswick Works. There are four lorry depots, situated at Chiswick, Parsons Green, Lillie Bridge and Charlton.

The control office is divided into two sections—a despatch side which handles all bids for transport and makes up loads, and a statistical section which keeps all records and returns. Items regularly transported include engineering units for trains, buses and trolley-buses, general stores, tickets, accumulators, tyres, commodities for widely-scattered canteens, lost property, advertising material, and waste oil. More than 250,000 electric lamp bulbs are delivered each year to London Transport railway stations.

Work done at night includes the delivery of plant and equipment, as well as some of the material for railway repair and maintenance work which has necessarily to be done after normal passenger traffic hours.

Special loads, such as transformers, cranes, bridge sections, bus washing machines and heavy machinery, are carried on semi-articulated low-loaders; other vehicles have been adapted to carry particular loads, such as accumulators or roadside shelters.

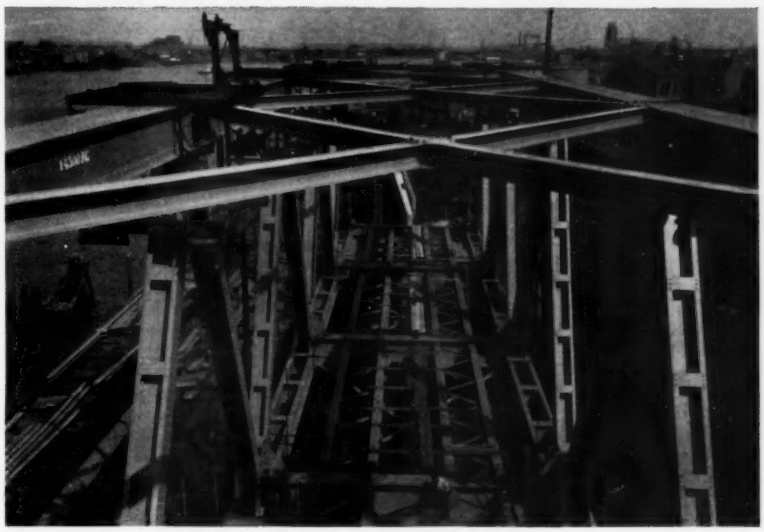
Tailboard Loading

Some lorries are fitted with Anthony Hoist hydraulic tailboard loaders and others with Burtonwood manual tailboard loaders, to facilitate quicker turnrounds at garages and depots. Maintenance of the fleet comes under the jurisdiction of the Chief Mechanical Engineer (Road Services); day-to-day inspections and minor adjustments are carried out at the four lorry depots by engineering staff lent from bus garages, and the docking of vehicles at one or other of the garages. Overhaul and docking programmes are drawn up jointly between the Central Distribution Service and the department of the Chief Mechanical Engineer.

Leyland 10 cu. yd. tipper, "L" type, used to collect rubbish from railway tracks and yards

New Moerdijk Bridge, Netherlands Railways

New spans for largest railway bridge in Holland to be floated into position without interrupting traffic



One of the half-sections for the new bridge under construction at the Dordrecht yard

THE Moerdijk Bridge, which, as was briefly described in our issue of December 19, 1952, is to be renewed, spans the largest of the estuaries of the combined Rhine and Meuse (Maas) delta, the Hollandsch Diep, and was originally 1,607 yd. long. The largest railway bridge in Europe when it was completed in 1871, it carries a dense passenger and freight traffic over the main route between Amsterdam, the Hague, and Rotterdam, and the southern districts of Holland, also Belgium, Luxembourg, and France.

For many years after the bridges over the main rivers had been constructed elsewhere in Holland, the problem of providing the necessary rail link over what is almost an arm of the sea seemed insuperable, although the energetic construction of railways under State auspices in the decade 1860-70 made the necessity for a direct railway route the more urgent so as to avoid the long detour through the centre of the Netherlands. The width of the estuary and its nearness to the sea set a particularly hazardous problem, as storms and the depth of the channel made it essential that the supports should be of exceptional strength.

In March, 1866, the first borings were made, and the work of building the bridge proceeded for five years. Although constructional costs were originally estimated at fl. 8,000,000 for the bridge with a single railway track, the actual expenditure amounted to only fl. 5,500,000. When the bridge was examined after the last war as a preliminary to making it fit for traffic again, the piers were found to be strong enough to carry two tracks, and the opportunity was taken to provide a broader platform on each pier so that when the time came for renewal the piers would be able to take a broader bridge without further adaptation.

Original Bridge

The original bridge consisted of 14 spans, each 339 ft. long, the whole bridge measuring 4,820 ft. from end to end. The spans rested on 13 piers between the two approach embankments, 2,300 ft. long on the northern bank and 1,310 ft. long on the southern. Ten of the piers have a concrete foundation; the other three, which are situated in the deepest part of the channel, were placed in position with pneumatic appliances.

The first public train passed over the bridge on January 1, 1872. Originally there was a swing bridge in the southern approach embankment but in 1936 two of the spans were raised a short distance and the swing bridge was converted to become a fixed span, after the adjacent road bridge was built without a movable section.

Half-section for the new bridge under construction at the Hollandsch Diep site; in the background is the existing bridge as reconstructed after the war

In 1940, the bridge was captured intact by enemy parachute troops helped by fifth columnists, but during the last winter of the war, when the south bank of the river was in Allied hands, the bridge was blown up in several places at different times, destroying six of the spans beyond repair when they collapsed into the water. Two of the piers were destroyed, as well as the northern abutment, while the southern abutment was severely damaged.

Reconstruction began in July, 1945; an account appeared in our issue of September 20, 1946. Four of the six damaged spans were replaced by prolongation of the northern embankment built out into the river and by a 98-ft. E.S.T.B. span. Two of the spans which had been transferred to provide a temporary section for the road bridge which runs parallel to the railway bridge a short distance down river, were ferried back in July and August, 1946, and replaced in position in the railway bridge.

The bridge, as reconstructed, comprised the following sections: a short span of British origin, 98 ft., an E.S.T.B. span; a Callender-Hamilton span, 177 ft. long; one span from the temporary Waterloo Bridge, 148 ft. long; a repaired span from the original bridge; two Callender-Hamilton spans of 165 ft., and seven more repaired spans from the original bridge. Two temporary piers were constructed which served as supports for the shorter spans which were supplied from Britain.

The reconstruction of one of the piers presented some difficulty, as the top had been blown to pieces; the caisson on which the pier rested was virtually intact, however, and after the rubble had been cleared it was possible to build a new concrete pier upon it.

The new double-track railway bridge is now under construction. The Netherlands Railways have placed orders with Werkspoor N.V. and a number of other Dutch contractors.

New Bridge as Planned

The new bridge will consist of five lattice spans, approximately 700 ft. in length, each resting on three supports, and one plate girder span measuring 98 ft. resting on two piers. Two of the five lattice spans are being built at Dordrecht, and when completed will be ferried into position from the yard to the bridge; this will necessitate the temporary removal of a 90-ft. section from the bridge carrying the secondary railway line from Dordrecht to Nijmegen over the Merwede river. The two spans to be ferried from Dordrecht will be conveyed in four sections, on four separate days. Two have already been floated into position.

The remaining three lattice spans will be built up at a temporary site on the bank of the river between the railway and the nearby road bridge at Moerdijk; these three spans will also be built as six half-span sections. Two are already in position.

There remain six half-span sections to be placed in position. It is understood that three of the completed spans are scheduled to be placed in position in the course of 1954, and the other two spans in 1955. This will enable the whole of the new bridge with its double railway track to be ready for traffic when the winter railway timetable is introduced in October, 1955.

New Control Room at Woking, Southern Region

Scheme for rehousing control staff completed by district office controlling 400 *route miles*

THE District Operating Control staff at Woking, Southern Region, have been transferred to a new building adjacent to the existing District Offices. The seating arrangements of the new building are similar to the Southern standard for London Districts with the desks arranged in one central block as at Waterloo, Redhill, and Orpington Control Rooms. The Control Room is well lit with roof lights as well as windows on three sides. Fluorescent lighting with gas as an alternative is provided. The building also accommodates a new manual/automatic telephone exchange which has taken the place of the station switchboard.

The site available for the building was very limited in size, and the space which could be allocated to apparatus has had to be carefully planned to accommodate the control telephone equipment (Standard Telephones & Cables Limited), automatic and manual general telephone apparatus (Ericssons Telephones Limited), and carrier wave trunk-telephone equipment (Siemens Bros. & Co. Ltd.) all of which are necessary for operational purposes. This has been done without undue overcrowding.

View of control room showing area controllers' desks and equipment with diagrams above. There are control positions on both sides of the central block

Extent of District

The Woking District covers approximately 400 route miles and includes the main line from Waterloo to Portsmouth and the Isle of Wight, in addition to the line to the West of England as far as Salisbury. The District also covers the busy London West Suburban area, the line from Waterloo to Windsor and Reading, and also the branches from the main line leading from Basingstoke and Salisbury to the Western Region line.

Traffic controlled from Woking includes the intensive morning and evening business services to and from London, and the weekend holiday traffic to the Isle of Wight, Bournemouth, Weymouth, and the West of England. A frequent service of boat trains between London and Southampton Docks is also controlled from Woking. Many special events are catered for as there are six racecourses in the District, including Ascot, Sandown Park, Hurst Park, and Kempton Park, and Twickenham deals with large crowds on big Rugby match days. Intermingled with the passenger services is a considerable movement of freight traffic.

The provision of this room completes the Southern Region postwar programme for rehousing Control staff.

RAILWAY NEWS SECTION

PERSONAL

Sayed Mubarak Zarroug, Minister of Communications and Leader of the House of Representatives of the Sudanese Parliament, is visiting Great Britain and Europe, where he will be making a tour of industrial centres. He will visit the works of railway equipment manufacturers, and will be accompanied by Mr. J. R. Farquharson, C.B.E., General Manager, Sudan Railways.

Mr. R. W. Taylor

Appointed Engineer-in-Chief, Crown Agents for Oversea Governments & Administrations

Mr. A. M. Rizk

General Manager, Egyptian State Railways, 1953-54

Mr. Reginald William Taylor, C.M.G., B.Sc. (Eng.), A.M.I.C.E., formerly Director of Public Works, Kenya, who, as recorded in our March 12 issue, has been appointed Engineer-in-Chief, Crown Agents for Oversea Governments and Administrations, was born at Dunkerque, France, in 1895. He was educated at St. Lawrence College, Ramsgate, and University College, London. Mr. Taylor was appointed an assistant engineer in the Public Works Department, Uganda, in 1920, becoming a senior assistant engineer in 1929, and an executive engineer the following year. In 1938 he was transferred to Nigeria as Senior Executive Engineer, and, in 1945, was appointed Deputy Director of Public Works Nigeria, becoming Director in 1947. In 1951 he became Director of Public Works in Kenya. He took up his present appointment last month.

We regret to record the death earlier this year of Mr. George Elliott, a former Superintendent of Locomotive Running of the New South Wales Railways, who retired in 1946 after completing 50 years of railway service. He began his railway career as a practical engineman. During the 1914-18 war, he served in France in the capacity of Company Sergeant Major in the 6th Broad Gauge Railway Operating Company, and was employed as a driver, and, subsequently, as Instructer, on English and French locomotives hauling troop and ambulance trains. He had the honour of being selected to drive trains conveying King George V, during his visit to the fighting front, and many other prominent persons, including Field-Marshal Sir Douglas Haig, and the then Prime Minister of France, Monsieur Clemenceau. For his war services Mr. Elliott was finally awarded the Meritorious Service Medal. In his subsequent capacity as Superintendent of Locomotive Running of the New South Wales Railways Mr. Elliott achieved conspicuous success in improving train schedules and loadings. He was the recipient of a watch presented to him by H.R.H. the Duke of Gloucester in commemoration of the first tour made of New South Wales by His Royal Highness during 1934, when Mr. Elliott was in charge of the Royal train.

Mr. A. M. Rizk, General Manager, Egyptian State Railways (now redesignated Egyptian Republic Railways), who, as recorded in our August 20 issue, has resigned, graduated from the College of Engineering, Giza, Cairo, in 1924. He entered the Mechanical Department of the then Egyptian State Railways, Telegraphs & Telephones in the same year. He came to England in 1925, and was trained on the London & North Eastern Railway under Sir Nigel Gresley at Doncaster from 1925-28, returning in 1934 for a short period on the Great Western Railway. On his return to Cairo in 1928 he resumed working for the Mechanical Department of the Egyptian State Railways, Telegraphs & Telephones as Junior Foreman at the Boulac Workshops, and, in course of time, was promoted through all workshop positions until being appointed Chief Mechanical Engineer. In 1947, he took up his appointment in London as the Egyptian Government's Chief Inspecting Engineer, which position he held until November, 1952. He became General Manager of the Egyptian State Railways, Telegraphs and Telephones, in 1953.

Mr. G. M. Thompson, District Motive Power Superintendent, Eastleigh, Southern Region, British Railways, whose biography was published in our August 13 issue, was incorrectly described therein as having been appointed District Motive Power Superintendent at Chester, upon his demobilisation from H.M. Forces. Mr. Thompson, who was subsequently appointed Assistant District Motive Power Superintendent at Nine Elms, Southern Region, was, upon demobilisation, appointed Assistant District Motive Power Superintendent at Chester.

Mr. J. W. Lamond

District Motive Power Superintendent, Thornton, Scottish Region, 1950-54

Mr. S. R. Walker

Appointed District Motive Power Superintendent, Thornton, Scottish Region

Mr. J. H. Hambidge

Appointed District Operating Superintendent, Stoke-on-Trent, L.M. Region

Mr. J. W. Lamond, District Motive Power Superintendent, Thornton, Fife, Scottish Region, British Railways, who has retired, joined the former Caledonian Railway Company in May, 1908, as an apprentice fitter at Perth. He continued to serve there until September, 1919, when he moved to Grangemouth as Chargeman Fitter. In December, 1928, Mr. Lamond was transferred to St. Enoch, Glasgow, and subsequently in 1932 to Motherwell and in 1935 to Inverness as Running Shed Foreman. In the following year he became Maintenance Assistant (Locomotives) to the Operating Manager, Glasgow, L.M.S. In October, 1945, Mr. Lamond was appointed District Locomotive Superintendent at Motherwell, and, in 1949, District Motive Power Superintendent at Carlisle (Kingmoor); in 1950 he moved to Thornton in the same capacity.

Mr. T. W. Royle, Assistant District Operating Superintendent, Burntisland, Scottish Region, British Railways, who, as recorded in our August 20 issue, has been appointed Assistant District Operating Superintendent, Leicester, London Midland Region, began his railway career on the former L.M.S. as a clerk at Boxmoor in 1935. In 1938 he became a traffic apprentice, and on completion of his training in 1940, he joined H.M. Forces in the Royal Engineers. At the end of the war, he was demobilised with the rank of Major. After further experience at Westhouses and at Wakefield, Mr. Royle was appointed District Signalmen's Inspector at Barrowhill in 1946. A year later he became Assistant to District Operating Manager, Rotherham, and, in 1948, was appointed Assistant to District Operating Superintendent, Leeds. He became Assistant District Operating Superintendent, Burntisland (Scottish Region) in 1952.

Mr. C. R. Atkins, Stores Officer, Scottish Region, British Railways, has been redesignated Stores Superintendent.

Mr. J. W. Dedman, M.Inst.T., District Operating Superintendent, Cambridge, Eastern Region, British Railways, has been appointed Assistant Divisional Operating Superintendent (Western), Liverpool Street.

Mr. S. R. Walker, A.M.I.Mech.E., Assistant District Motive Power Superintendent, Edinburgh, Scottish Region, British Railways, who, as recorded in our August 13 issue, has been appointed District Motive Power Superintendent at Thornton, Fife, takes up his new position as from July 19, 1954. Mr. Walker entered the service of the former London & North Eastern Railway in 1927, and received his mechanical training at Doncaster Works and the Motive Power Depot at York. He gained further experience in motive power depots at Immingham, Stratford, Boston, Derby, and Leicester before his appointment as Assistant District Motive Power Superintendent at Burntisland, Scottish Area, L.N.E.R., in 1941. In the following year he moved to Lincoln as Assistant District Motive Power Superintendent. Mr. Walker returned to Scotland in the same capacity at Edinburgh in 1944.

Mr. J. T. Whiteford, General Passenger Traffic Manager, Canadian National Railways, is arriving in this country by air from Montreal on Monday, August 31. After four days in London he will tour British and European railways and will visit C.N.R. offices in Europe. His itinerary includes the United Kingdom, Holland, Belgium, Germany, Denmark, Switzerland, Italy, and France. The purpose of his tour is a comparison of the passenger equipment and facilities of the railway systems he visits. Mr. Whitehead, who was born in Paisley, emigrated to Canada where he joined the C.N.R. as a junior clerk in 1913. He has acquired an intimate knowledge of passenger traffic matters during a railway career of over forty years. Mr. Whiteford was appointed General Passenger Traffic Manager for the C.N.R. in 1953.

Mr. F. A. Keeling has been appointed Director of Finance, Shell-Mex & B.P. Limited. This is a new position and replaces Mr. Keeling's former position of Controller of Accounts.

Mr. J. H. Buscombe, of the finance administration of the Shell Petroleum Co. Ltd., will shortly join Shell-Mex & B.P. Limited as General Manager, Finance & Accounts.

Mr. J. H. Hambidge, Assistant District Operating Superintendent, Leicester, London Midland Region, British Railways, who, as recorded in our August 13 issue, has been appointed District Operating Superintendent, Stoke-on-Trent, began his railway career as a junior porter control train reporter at Ambergate in 1924. Soon afterwards he became a clerk and gained experience in various capacities at Derby, Euston, Crewe, Nottingham, Burton, and Peterborough. In 1946 Mr. Hambidge was appointed Assistant to the District Operating Manager at Derby and, in 1949 he went to Glasgow as Chief Controller & Chief Trains Clerk. He was later re-designated Chief Freight Trains Clerk. In 1951 Mr. Hambidge became Assistant District Operating Superintendent at Leicester, the position he now leaves for his present appointment. Mr. Hambidge is a well-known athlete in the Midlands and represented Great Britain at the Olympic Games at Amsterdam in 1928 in the 200 metres flat race. He was the L.M.S. 100 yards and 220 yards champion in 1928, and has also represented British Railways in international events.

Mr. I. R. Frazer, Civil Engineer, Scottish Region, British Railways, retired on August 25. He has been succeeded by Mr. M. G. Maycock, Assistant Civil Engineer, Scottish Region.

The Late Mr. J. P. Taylor

A memorial service for the late Mr. John P. Taylor, Editor of *Shipbuilding & Shipping Record*, our associated weekly contemporary, from 1913 to 1953, was held at the Church of St. Dunstan-in-the-West, Fleet Street, E.C., on Friday, August 20. The service was conducted by the Rev. E. G. Turner, Rector of St. Giles, Cripplegate.

In addition to the family mourners, there was a large congregation which included members of the board and staff of Tothill Press Limited, and representatives of a large number of organisations connected with shipping and shipbuilding.

Mr. S. E. H. Kewney, A.M.I.Mech.E., Assistant to the Managing Director of Andrew Barclay, Sons & Co. Ltd., has been appointed a Director and General Manager of the company.

The Queen has approved the appointment of Mr. A. S. Quartermaine and Mr. G. A. Jellicoe as members of the Royal Fine Art Commission in succession to Sir William Halcrow and Mr. J. N. Summerson, who has retired.

Mr. E. S. Waddington, of the Industrial Products Division of Philips Electrical Limited, has been re-elected Vice-Chairman of the Finance Committee of the Institute of Welding.

Mr. Robert Atkinson has been appointed to the boards of directors of the Hamworthy Engineering Co. Ltd. and British Combustion Equipment Limited. Mr. H. A. Cheetham has been appointed Chief Engineer of British Combustion Equipment Limited.

Mr. Oliver Lyttelton, who was recently created a viscount after resigning his position in the Cabinet as Colonial Secretary, has been appointed a Director of the Alliance Assurance Co. Ltd. He has also been elected Chairman of the British Thomson-Houston Co. Ltd.

Mr. C. W. Sant, Assistant Manager of the Motor Department of Shell-Mex & B.P. Limited, has retired after nearly 43 years with the company and its predecessors. Another retirement is that of Mr. E. E. Fidler, Communications Manager. He had been with the company for 38 years.

Sir John Greaves has decided to relinquish his position as Managing Director of Davey, Paxman & Co. Ltd., on September 30 next, and, although he continues as a Director of Ruston & Hornsby Limited, he will be retiring from the board of Davey, Paxman & Co. Ltd. Mr. G. W. Bone, Assistant Managing Director, whose appointment to the board was recorded in our August 13 issue, will succeed Sir John Greaves as Managing Director.

Mr. J. W. Campbell, Chief Accountant & Assistant Secretary, Stewarts & Lloyds Limited, who was lent to the Iron & Steel Corporation in 1951 as Financial Adviser, and who became the Financial Adviser of the Iron & Steel Agency upon its formation, has, at the request of the Iron & Steel Agency, been released from his appointment with Stewarts & Lloyds Limited in order that he may continue in his capacity of Financial Adviser to the Agency. Mr. W. L. Jollie, Chief Accountant & Assistant Secretary of the Stanton Ironworks Co. Ltd., has been appointed Chief Accountant of Stewarts & Lloyds Limited and all that company's United Kingdom subsidiaries. These changes took effect as from August 19, from which date Mr. Jollie also relinquished the assistant secretaryship of the Stanton Ironworks Co. Ltd.

B.T.C. Pension Scheme

The Central Committee appointed to operate the British Transport Commission Pension Scheme for male wages grades, which comes into operation on October 1 next, held its first meeting on Monday, August 23, at the headquarters of the Commission under the chairmanship of Sir John Benstead, Deputy Chairman of the B.T.C.

The scheme covers male wages grades in the service of British Railways, the Docks & Inland Waterways, the Hotels & Catering Services, the London Transport Executive, and at the Commission headquarters.

The Committee consists of ten members appointed by the B.T.C. and ten members nominated by the Trade Unions.

The composition of the Central Committee is as follows:—

APPOINTED BY THE COMMISSION

British Transport Commission:—

Sir John Benstead, Deputy Chairman; Sir Reginald Wilson, Member; Mr. W. P. Allen, Chief of Establishment & Staff.

British Railways:—

Messrs. C. K. Bird, Chief Regional Manager, Eastern Region; J. W. Watkins, Chief Regional Manager, London Midland Region; R. Burgoyne, Chairman, Railways Staff Conference.

London Transport Executive:—

Messrs. J. Cliff, Deputy Chairman; A. Bull, Chief Staff & Welfare Officer.

Docks & Inland Waterways Management Board:—

Mr. J. Donovan, Member.

Hotels & Catering Services:—

Mr. F. G. Hole, Chief of Hotels & Catering Services.

NOMINATED BY TRADE UNIONS

National Union of Railwaymen:—

Messrs. J. W. Stafford, President; G. C. Gibson and G. E. Walton, Members, Executive Committee; J. Campbell, General Secretary.

Associated Society of Locomotive Engineers & Firemen:—

Messrs. N. A. Pinches, President; A. Hallworth, Assistant General Secretary.

Transport & General Workers' Union:—

Messrs. A. E. Tiffin, Assistant General Secretary; A. J. Townsend, National Officer.

Confederation of Shipbuilding & Engineering Unions:—

Messrs. R. Openshaw, Member, Executive Committee; Gavin Martin, General Secretary.

Secretary:—

Mr. R. Byron-Scott, Staff Officer (Pensions & Compensation), British Transport Commission.

In the photograph reproduced below are shown, left to right:—

(*Back row*) Sir Reginald Wilson, Messrs. R. Byron-Scott, D. W. Aldred, A. Bull, Harold Clay, C. K. Bird and J. Donovan. (*Standing*) Messrs. Gavin Martin, Frank Gilbert, J. W. Watkins, R. Openshaw, W. S. Morgan, R. Burgoyne, A. J. Townsend, J. Campbell, N. A. Pinches, A. Hallworth, G. C. Gibson, G. E. Walton. (*Seated*) Messrs. J. Cliff, A. E. Tiffin, Sir John Benstead, Messrs. J. W. Stafford, W. P Allen.

Members of the Central Committee for operation of the British Transport Commission pension scheme, at the first meeting

PLASTICS FOR REINFORCED TUBING.—Bowden (Engineers) Limited, of Willesden Junction, London, has developed what is known as the Bowdenflex pipe unit, incorporating reinforced plastic tubing, and which is said to be able to withstand pressures in excess of 10,000 lb./sq. in. For conveying acid, gas, air, or any type of fluid, an inner plastic tube is selected and reinforced with wire braiding to withstand the pressure required. An outside tube may be fitted to resist external factors such as fire, and if necessary a further wire braid may be introduced over the outside for protection against abrasion and so on. This new process is used in conjunction with the Bowden patent Series 2,000 swaged coupling, with a lip seal and wire braid interlock.

BRITISH STANDARD FOR RAILWAY ROLLING STOCK MATERIAL.—The British Standards Institution has just issued a revised edition of Part 5, "Copper" of B.S. 24, "Railway rolling stock material" which specifies requirements for copper in the following form: Specifications No. 11: "Copper plate for locomotive fireboxes"; No. 12: "Copper rod for locomotive stay bolts, rivets, and so on"; and No. 13: "Copper tubes for locomotives." In this revision, the requirements previously covered separately by Specifications Nos. 12 and 12a for rolled and extruded rod respectively, are incorporated in one specification, No. 12, and those for copper tubes and pipes for locomotive boilers previously covered by Specifications Nos. 13 and 15 respectively have been incorporated in Specification No. 13 under the title "Copper tubes for locomotives." Specification No. 14, "Brass tubes for locomotive boilers," which was included in the earlier edition of the standard has been omitted, and is met by the existing British Standard 885, "Brass tubes for general purposes." Copies of this standard may be obtained from the British Standards Institution, 2, Park Street, London, W.1. Price 4s.

Ministry of Transport Accident Report

Watford, February 3, 1954 : British Railways, London Midland Region

Lt.-Colonel G. R. S. Wilson, Chief Inspecting Officer of Railways, Ministry of Transport and Civil Aviation, inquired into the accident which occurred at Watford at about 5.7 p.m. on February 3, 1954, when the 10.0 a.m. "Royal Scot" express Glasgow to Euston, consisting of 10 bogie coaches drawn by class "8P," 4-6-2 locomotive No. 46250 was travelling at about 65 m.p.h. through Watford Tunnel and a broken rail caused the last pair of wheels of the eighth coach to become derailed. The rail had broken under the train, which continued forward without further derailment for nearly 1½ miles on straight track until the derailed wheels damaged the points and crossings at Watford No. 2 signalbox.

This derailed completely the ninth and tenth coaches, which parted from the train and stopped upright against the up fast platform 250 yd. beyond the box. They grazed the sides of the second, third, fourth, and fifth vehicles of the 4.37 p.m. express, Euston to Wolverhampton, which had started from Watford Junction but was stopped again when its driver noticed the other train was in trouble. The speed of the latter had been reduced somewhat by the pulling of the communication chain in the ninth coach soon after it emerged from the tunnel. The engine and leading coaches were stopped in about 440 yd. by the brakes, after the parting behind the eighth coach or about 3,200 yd. from the point of initial derailment, with all wheels on the rails, except the trailing bogie of that coach, which became detached at the last moment.

The Wolverhampton train could not proceed, but eventually the engine and six leading vehicles of the "Royal Scot" went forward. There was no severe structural or internal damage to the three derailed coaches; 15 of the 100 passengers in the up train sustained minor injuries and one railway servant suffered from shock. Nobody in the other train was injured and damage to it was superficial. Assistance was promptly summoned.

A complete blockage of this main route to the north resulted, with serious traffic dislocation, but all four lines were available again at 9.40 p.m. on the next day, but with speed restrictions for a time on the up fast line. Daylight was fading. It was fine and there had been hard frost for several days, but temperature in the tunnel at the site of the broken rail was well above freezing. (There are two parallel tunnels, for fast and slow lines, with their southern portals about a mile north of the station.)

Train Communication Apparatus

The train had the usual communication apparatus in which pulling the chain opens a valve admitting air through a $\frac{5}{8}$ in. dia. pipe and applies the brake slightly. On observing this to have occurred, the driver must stop with as little delay as possible unless at an awkward place—for example, in a tunnel or on a viaduct—when he should be able to keep running with the aid of the large ejector, if the chain has been pulled in one coach only.

In view of evidence tendered by two passengers regarding the operation of the chain and the fact that the driver noticed no difference, either in speed or "feel" of the train, until the severe jerks came at the station, Colonel Wilson, who had no doubt that the train had just about emerged from the tunnel when the chain was pulled in the ninth coach, and thought it unlikely that it was operated in the eighth until just prior to the full brake effect occurring, asked for running tests.

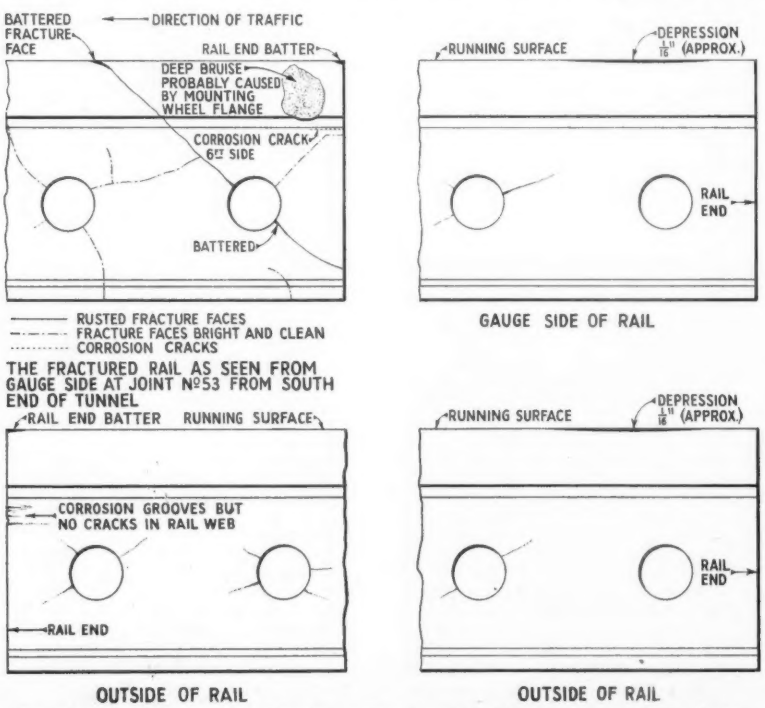
These were effected with a train of very similar formation, hauled by an engine identical with that concerned in the accident. Colonel Wilson rode on it accompanied by the Motive Power Superintendent, and an officer of the Mechanical & Electrical Engineer's Department. The Operating Superintendent and other officers travelled in the 9th vehicle. Two points, not disclosed to Colonel Wilson, had been selected for operating the chain. The first test was made at 60 m.p.h. and neither he nor the Motive Power Superintendent noticed anything, but the driver, aware of the purpose of the tests and watching his gauge, saw vacuum fall from 21 to 18 in., shut off steam, and made an emergency application, stopping in 62 sec. or 1,360 yd. from the point where the chain was pulled. No officer at the rear noticed any braking effect until the emergency application.

The driver then was told not to look at the gauge until he noticed some difference of "feel" and the chain was pulled when speed was 78 m.p.h. on the long falling gradient of 1 in 335 from Tring. Colonel Wilson noticed nothing abnormal until informed that vacuum was down to 15 in. The driver then made a service application and the train stopped at 2 m. 1,600 yd. from the point of operation of the chain, in 2 min. 30 sec. The driver said he had felt a slight backward and forward surge breaking the evenness of running, and Colonel Wilson then recollected feeling something of the kind.

Considering these tests inconclusive, he wished for a third, but it was too late to arrange one. It happened, however, that the Operating Superintendent decided to pull the chain in the ninth vehicle about where that had been done in the "Royal Scot"; speed was then 67 m.p.h. Nobody on the engine, driver included, noticed anything up to two miles farther on, when the fireman was preparing to lower the scoop at Bushey water troughs and said something to the driver who looked at the gauge. Speed was noticeably diminishing then and Colonel Wilson saw that vacuum was about 15 in. only, being held at that by the small ejector. The driver was told merely to shut off steam, and the train stopped in 3 m. 220 yd. in 3 min. 55 sec. from the chain operation point. The needle in the saloon at the rear did not go below 15 in. It was found that the large ejector would very gradually restore vacuum against the chain "leak." The train could have been stopped more quickly in this case had the driver braked on seeing from the gauge that the chain had been pulled.

It was clearly shown, however, that if this is done towards the rear of a train of this formation travelling at 65 to 70 m.p.h. it may run as much as two miles before the driver becomes aware of anything abnormal, if he is not at the moment looking at the gauge.

Stationary tests with such a train also were made. With small ejector working continuously vacuum fell in 40 sec. after



Drawing showing details of broken rail end causing the derailment at Watford on February 3, 1954, and of typical cracked ends found after removal of rails from up fast line in the tunnel

the chain had been pulled in the 9th coach only to 15 in. at the engine and 12 in the rear brake. This at, say, 60 m.p.h., would be the time taken by the "Royal Scot" to cover the some 1,550 yd. from the point where the passenger pulled the chain to where serious derailment began.

The Track

Colonel Wilson found the tunnel generally dry, except for 100 yd. at the north end. It had no invert and the track foundation was sandy with granite ballast to about 6 in. below the sleepers. Gradient is falling at 1 in 1,038 in the up direction and the track generally well drained. Ventilation by five shafts is good but with such heavy traffic the tunnel is seldom clear. The rail which broke under the train was on the 6 ft. side and 109 lb. f.b. The fracture was between the fishplates at the running-on end at joint 53 from the south end. This length of standard f.b. track was laid in November, 1950. Ballast was dirty but good and not clogged. Track alignment seemed to leave little to be desired; "top" was very good. Slight depression was noticeable at a few joints and voidmeter readings later proved joints to be solidly packed and the stiff f.b. rails not showing a "false top." Hallade recordings showed a considerable improvement in packing and alignment during the last two years. Rails and fishplates were heavily coated with dirt and rust; examination of ends and surfaces was deferred until the rails could be removed.

The average weight of the 6-ft. rails had fallen to 93½ lb., a 14 per cent loss, mainly by corrosion, and of the cess rails to 97½ lb., or 10½ per cent.

Colonel Wilson examined the sawn off rail end with its loose pieces and fishplates with Regional Engineers and the Superintendent of the Metallurgy Division at Derby of the B.T.C. Research Department. The last named furnished him with a very complete report, numerous details of which are reproduced in his own. It stated that much investigation had been conducted by that department on the rails on both fast lines since the 113-lb. type had been laid in February, 1949. The up line was relaid in 1950, as already stated. Especial difficulty had been experienced in maintaining joints on the right-hand rail since continuous blow-down was introduced on locomotives; prior to that the tunnel had been dry and not especially difficult to maintain.

In 1932-39 water softening was brought progressively into use on the former L.M.S.R. and to obtain its full benefit it was necessary to avoid undue concentration of soluble salts in the boiler water. It was arranged for this to be blown down continuously during running at about 2½ gal. per mile. By October, 1939, this was in use on practically the whole of the locomotives. The discharge was on the right-hand side and after a time adverse effects became noticed including corrosion of track fastenings and weakening of the ballast supporting the right-hand rail. Rail breakages showed a marked bias towards that rail, attributable to the effects of the water, no such bias being seen elsewhere. In July, 1951, instructions were issued under the then Railway Executive to reduce the blow-down to ½ gal. per mile and discharge into the ash pan to be evaporated before reaching the track. This was completed throughout the L.M. Region by December, 1953.

This officer's report stated further that no unusual mechanical and electrical properties were found in the fractured rail; it complied with the British Standard Specification No. 11 for medium manganese acid Bessemer rail steel. It referred to the loss of section by wear and corrosion as typical of tunnels carrying a similar amount of traffic. Normal up and down movement of a joint would be greater than in the open, owing to the wetness of the tunnel and difficulties of routine maintenance. Movement of the various parts of the joint had caused high stresses around the bolt holes under corrosive conditions. Many small corrosion fatigue cracks had developed, some having grown until the notch effect—to which rail steel is normally sensitive—had caused sudden fracture under the particular conditions of stress arising at the passage of a train.

Use of Crack Detection Apparatus

Ultrasonic crack detector equipment was applied the day after the accident to the up fast line and indicated that 21 other rails might be defective. In four rails were found serious cracks in the web extending in one case up to, but not through, the head. These were changed. A further test under possession on February 7, revealed defects at the running on ends of 17 rails. In 10, however, nothing was then actually seen. The line was relaid with 95 b.h. track on February 14 and the 109 f.b. rails thoroughly cleaned and examined. Of the 10 suspected rails seven were then found to have cracks radiating from the bolt holes. There were thus 19 rails with visible cracks, 11 of which were 6 ft. rails. Of the 21 subjected to this scientific test four called for immediate removal. Except for the rail which actually broke none of the cracks could have been seen without removing fishplates and Colonel Wilson considers it doubtful whether the cracks in more than seven or eight of the 18 others could have been found by inspection *in the tunnel* after fishplate removal.

The report gives a history of the rails in both up and down fast lines. The up fast was relaid with 95 lb. b.h. track in June, 1945. A 6 ft. rail broke in December, 1946, and a cess rail in April, 1947. The rails only were renewed in April, 1948, owing to loss by wear and corrosion. In February, 1949, both lines were completely relaid with L.M.S.R. standard 113 lb. f.b. rails because reballasting had become necessary and it was considered desirable to relay with stronger track and possibly save in maintenance. This gave no trouble for nine months but in December, 1949, a crop of failures began. After nine 6 ft. rails had broken at the running on end, all in the northern half of the tunnel, the 113 lb. track was replaced by 109 lb. f.b. No breakage occurred for 22 months and then failures at the running on ends began again; two in 1952, four in 1953, and then the one causing this accident.

The down fast was relaid with 95 lb. b.h. rails in April, 1944. The rails only were renewed in July, 1947; one 6 ft. rail had failed two months before. There was no other failure and renewal with 113 lb. f.b. track was effected in February, 1949. This went 18 months without failure. A series of breakages began in October, 1950, and by the next relaying with 95 b.h. rail in September, 1952, 10 broken 6 ft. and seven cess rails had been changed. This b.h. track has given no trouble to date.

The Railway Executive had taken special notice of the 113 lb. rail failures and held conference with the officers concerned. Special examination was made of the down fast in April, 1952, after a failure and in the September four breakages occurred in two days and a speed restriction was put on pending the relaying. A special report was furnished to the Chief Regional Officer by the Civil Engineer. This referred to an investigation by the Research Department into the 113 lb. rail failures on the up fast. Conditions were similar. Faulty joint packing, corrosion of the rail ends, fishplates and fastenings, largely accounted for by the continuous blow down. It was, however, anticipated that with reduced blow down and adequate maintenance for which periodical possession was essential, no further abnormal difficulties would arise. The Department investigated the condition of the 165 113 lb. rails taken from the down fast, of which 34 per cent of the 6 ft. and 15 per cent of the cess rails had "incipient flaws" at the running on ends. After a conference with all his Chief Permanent Way Inspectors, the Civil Engineer issued on December 4, 1952, a written directive to all District Engineers covering track maintenance in tunnels. This is given in Colonel Wilson's report and lays stress on proper joint maintenance and requires six-monthly instead of yearly removal of fishplates and examination of rail ends; it lays personal responsibility on the District Engineers for giving effect to the instructions, organising the work systematically, etc.

Evidence as to Permanent Way

Colonel Wilson heard evidence from the ganger, of Polish nationality, who had been in charge for eight months, after being a lengthman in the gang for four years and from the permanent way inspector responsible for the section, a man of 61 appointed to Watford Junction in 1949, but responsible for the line in the tunnel only from May, 1951, and from the chief permanent way inspector of the London Engineering District for 6½ years after 6 months service in like capacity at Northampton, and eight years as an inspector; the last had been very dissatisfied with the condition of the length when the present inspector took over, but considered that he had effected a very great improvement. This evidence covered many small details, but it emerged from it that the inspector, who in fact admitted it, had not strictly complied with the directive regarding six-monthly removal of fishplates and examination of rail ends. He said man power was limited and he thought it better to employ Sunday gangs on what he considered more pressing repair work, such as lifting and packing joints to prevent movement under traffic. He thought, however, there were few joints where the plates had not been changed during the year on account of wear and corrosion of the fishing surfaces. Rail ends would be examined at the same time. It was unlikely the ganger could have seen the crack at joint 53 in ordinary daily examination and doubtful if it would have been noticed even had the fishplates been removed. The ganger reported every morning by telephone when he was going into the tunnel. He was a very good man but his gang with its depleted strength was quite insufficient for the maintenance of this difficult tunnel length. It was not alone in this respect. Total available strength of 14 gangs maintaining the 13 miles of 4-track main line between Wembley and King's Langley was 53; only 66 per cent. of the total establishment of 79. The chief inspector attributed the continuing record of broken rails to the aftermath of bad maintenance, especially loose joint packing, and blow-

down effects, as generally the tunnel was dry and formation good. He laid stress, however, on the "amazing" improvement achieved by the inspector and ganger during the past year.

Chief Inspecting Officer's Conclusions

The general standard of maintenance was good, but nobody had realised how many rail ends were defective from corrosion fatigue cracks at points of stress concentration round bolt holes, resulting from interplay of adverse conditions during earlier life of the track. Ordinary corrosive effects were accentuated on the 6 ft. side by blowdown water and faulty joint packing, to which that discharge had contributed. Rail ends had become overstressed under wheel impact and the joints lacked the full support of the fishplates where corrosion had destroyed the essential close contact of fishing surfaces. Probably it was felt that with marked improvement in general maintenance and elimination of blowdown the long standing broken rail trouble was on the way to being mastered. It had not been appreciated, however, that the damage had been done already by past maintenance and Colonel Wilson thinks insufficient heed had been taken of the regular sequence of broken rails in the up fast line which began in September, 1952, having regard to the experience with the 113 lb. track. Four breakages by April, 1953, should have suggested early renewal of the 109 lb. track to be prudent. It is not always easy, however, for engineers to decide at what stage track giving trouble should be completely renewed in advance of programme and the Civil Engineer was optimistic in reporting that no further abnormal difficulties should arise. This opinion was based on the justifiable assumption that meticulous attention was being paid by District Engineers to his clear directive on maintenance in tunnels.

Fatigue cracks round bolt holes are difficult to see in initial stages but not usually an immediate source of danger. They are always likely to extend; it is very important they be detected before going too far, which was the object of the six-monthly rail-end examination ordered by the Civil Engineer, regrettably not carried out. His directive was repeated by the London District Engineer to the permanent way inspectors on January 12, 1953, after over a month's delay, but no systematic examination undertaken on the up fast line until three days before the accident, when time was insufficient to reach the joint involved. The inspector had not appreciated that ordinary changing of worn and corroded fishplates, attended to with much care by the ganger, was no substitute for systematic examination under a possession, but Colonel Wilson is satisfied that he thought the spirit of his instructions was being fulfilled; he was conscientious and energetic in the discharge of his duties. Too much responsibility should not be accorded to him for failing to discover the defect before it became dangerous.

The main fault is considered to lie with the District Engineer's headquarters where organisation, recording and control of tunnel maintenance work were inadequate to ensure observance of the prescribed routine. No responsibility rests with the present District Engineer, however, who assumed charge two days before the accident.

No reason is seen to doubt the research engineer's report on the probable course of the rail fracture. It seems unlikely that the detached piece could have rocked upward, before the ganger's examination that morning. Such an obviously dangerous condition would hardly have escaped the notice of so conscientious a man, though a fine crack through the rail head would have been much less easy to see. The final clean fractures which detached the smaller triangular head piece probably occurred under the "Royal Scot" or a train not long before. Nothing prevented it then from working out. It was fortuitous that it got askew as the last wheel of the eighth coach passed. With it thrown clear the following wheels passed underailed over the 6 in. gap, but with considerable shock. Derailment probably would have been confined to this pair of wheels had the guard applied the brake promptly on hearing what he described as a heavy crash. His van must have experienced severe jolts as it passed over the gap. Colonel Wilson does not accept his excuse that he wished not to stop the train in the tunnel. There was ample braking distance from its end to the connections at No. 2 box, where serious trouble from the derailed wheels became almost inevitable. The passenger in the ninth coach operated the chain commendably quickly, no doubt soon after it emerged from the tunnel. The resulting light application must have reduced speed to 50 m.p.h. in the 1,300 yds. to the point where the coach broke away and vacuum became destroyed, or the front portion would not have stopped where it did. The driver had no reason to be looking at his gauge and, in view of the tests above referred to, Colonel Wilson can understand that he felt nothing abnormal in the running until the breakaway and relieves him of all responsibility in the case.

Remarks and Recommendations

Rail steel has to be a compromise between hardness and toughness. Its chemical composition, treatment and manufacture and design of rail section have been continuously the subject of research but no rail has been made absolutely proof against failure under traffic. In recent years 1,000 defective rails have been removed annually from the 36,500 miles of British Railways running tracks, more than a third broken, but this is a considerably better record than that of most other countries. Rarely are the cases not discovered before serious risk arises. Besides this derailment there has been but one other case since the war in which a broken rail was responsible for personal injuries, in 1947. That rail broke in the open and derailed a passenger train. It was overdue for renewal but serious steel shortage prevailed.

While the breakage problem always has been more serious in steam worked tunnels, owing to corrosive effects, it is also never so easy to maintain and pack joints there as in the open. Special attention has to to be given to periodical inspection of rail ends to discover incipient defects, but circumstances illustrate the care generally exercised. In this case quality and quantity of labour had been insufficient for a long time to maintain the track to the standard required. All circumstances of this accident were made known to all Regions, to put engineers on their guard, and special examinations in tunnels carried out forthwith and periodical procedure strengthened. All Regions are now supplied with ultra-sonic detectors, being used primarily in tunnels and at other troublesome places, which should prove as successful as with the detection of axle flaws.

Experience gained with experimental f.b. track before the war led to the standardisation in 1948 of an improved 109 lb. f.b. rail for main line renewals. By the end of 1953 approximately 10 per cent of the running track mileage was so laid. (Proportion on L.M. Region, 14 per cent.)

Colonel Wilson gives a table of breakages and comparative incidence during the last three years between b.h. and f.b. track on the L.M. Region, and elsewhere. (Renewals and maintenance arrears were heavier on the then L.M.S.R. after the war than on other lines). By 1953 failures were not in excessive proportion but the increasing number of f.b. ones was out of all proportion to the f.b. mileage with strong bias to the 6 ft.—or blow down—side, suggesting that where corrosion is severe, the stiffer rails may be more susceptible to fatigue flaws at their ends, where it is difficult to maintain solid packing. Although it is now stopped, the effects of the blow down probably will be felt for some time to come. The change to heavier f.b. rails was progressive and has led to great economies, but this accident points to the need for further investigation into causes of rail end failures. This is being undertaken as a matter of first importance and the fishplate being redesigned to allow more margin for keeping surfaces in close contact. Welding of rails also is being extended.

The report deals with the railway labour problem and great difficulties arising therefrom; the railways are about 7 per cent short on the platelaying grades but engineers have done much, by extending mechanisation, etc., to adjust themselves to changed conditions, unfortunately resulting in fewer men being fit for promotion to supervising posts. There is also a pronounced shortage of experienced technical staff for planning, etc., and progress has been possible only by overburdening those qualified for responsibility. There is no cause, however, for anxiety about safety of permanent way as a whole, but the British Transport Commission is far from satisfied with the position and giving urgent attention to these staff difficulties, recognising it must never relax endeavours to improve track design, material and maintenance methods.

Train communication is a requirement under an Act of 1868 and for many years, as the most practical reliable method, the passenger has been able to make a light brake application. With the vacuum brake on steam trains the driver can overcome the action and avoid stopping in an awkward place. The apparatus is seldom used in genuine emergency, but there are occasions—fire, etc.—when a passenger should be able to command a rapid stop, and Colonel Wilson recommends that design be thoroughly reviewed with a view to obtaining quicker response.

COLMONOY HARD-FACING ALLOYS.—The practice of protecting wearing surfaces of metals has increased considerably in recent years, and an illustrated brochure on the uses and methods of application of Colmonoy hard-facing alloys has been issued by Wall Colmonoy (Canada) Limited; the British Branch address is Carfin Industrial Estate, Motherwell, Scotland. The brochure, No. 77, describes the processes for depositing the various types of nickel and iron base alloys and their functions, which includes resistance to corrosion, abrasive action, heat, and wear. Details are also given of the uses of Colmonoy castings for parts subject to excessive wear, and also the use of Nicrobraz, a heat- and corrosive-resisting alloy for brazing stainless steels and special alloys.

"Moving Millions" Exhibition Change to Buses

The London Transport Moving Millions Exhibition at Charing Cross Underground Station, reference to which was made in our July 16 issue, took buses instead of the London Underground as its theme as from August 23. The exhibition is open every weekday from 10 a.m. to 8 p.m. until September 25.

The Moving Millions exhibition has attracted more public interest since it opened on July 12 than anything previously held on this site, and the London Transport Executive estimates that by the time the exhibition ends on September 25 it will have been seen by over 250,000 persons.

Just as visitors "drove" a tube train during the railway stage of the exhibition, they can now sit at the wheel of a London bus. In a full-size model bus cab, they will turn the steering and work the preselective gears.

Standard bus components, testing machines, and working models demonstrate the measures taken to ensure safe travel and to secure maximum economy in maintaining the bus and coach fleet, the largest in the world under one management.

Working Models

Exhibits include: the compressed-air braking system of a bus; a working model of a bus engine; a working section of a bus lubricating system; worn bus parts before and after they have been re-conditioned for further use; precision tools made by craftsmen apprentices in the first year at the Chiswick Bus Works; and scale models of a London bus and of the new overhaul works at Aldenham.

Staff & Labour Matters

Railway Wages

After the request of the A.S.L.E.F. that its demands in connection with the proposed new wages structure for footplate staff and other locomotive grades be referred to the Railway Staff National Council, the N.U.R. executive committee asked on August 18 for an immediate meeting with Sir Brian Robertson, Chairman of the British Transport Commission. In reaching this decision the N.U.R. executive endorsed the rejection by that union's negotiating committee of the B.T.C. proposals for revising the existing wages and salaries structure.

Sir Brian Robertson agreed to this request in an effort to overcome the deadlock which had been reached and at the same time similar facilities for talks were offered to the other two unions, the T.S.S.A. and the A.S.L.E.F.

The T.S.S.A. executive, meeting on August 21, agreed to meet Sir Brian Robertson in the hope that some solution would be found. The General Secretary of the T.S.S.A., Mr. W. J. P. Webber, said that his executive had found the Commission offer completely unacceptable. He complained that under the offer the salaried staff would not receive anything like the comparable percentage increases over prewar values as the conciliation grades would get. The A.S.L.E.F. later announced its willingness to meet the Chairman of the Commission, and separate talks with each of the Union leaders ultimately took place on Tuesday afternoon, August 24.

It was later announced that the talks with representatives of two of the unions, the N.U.R. and T.S.S.A., had been adjourned and that further meetings would be arranged without undue delay. The representatives of the A.S.L.E.F. stated that they were referring the matter to the appropriate machinery of negotiation.

Strike Threats

On August 21, the executive committee of the Manchester district council of the N.U.R. passed a resoluton instructing the national executive of the union to inform the Chairman of the B.T.C. that, failing a satisfactory settlement of their demands, the union would resort to strike action. Members of the Banbury branch of the A.S.L.E.F. also decided at a meeting on August 22 to support strike action unless constitutional negotiations resulted in acceptance of A.S.L.E.F. demands.

Contracts & Tenders

The Hunslet Engine Co. Ltd., has received from the Peruvian Corporation Limited an order for a metre-gauge oil-burning 2-8-0 locomotive for the Guaqui-La Paz Railway.

British Railways, Southern Region, has placed orders as follows:—

The Astolat Co. Ltd., Guildford: new platform buildings, Chestfield & Swalecliffe Halt

Caffin & Co., Ltd., London, W.C.2: removal of roof, Crystal Palace High Level Station

British Railways, North Eastern Region, have placed contracts as follows:—

Steel Engineering Products Limited, Manchester: one Coles S.1210 mobile crane, Bradford Bridge Street Goods Yard

F. & J. Watkinson, Bradford 4: demolition of Heckmondwike Spen, Gomersal, Liversedge Spen, Cleckheaton Spen, Battyeford, and Northorpe Higher Stations

Ruberoid Co. Ltd., Newcastle-on-Tyne 6: waterproofing of up and down main lines at King Edward Bridge, Newcastle

British Railways, Eastern Region, have placed contracts as under:—

Leonard Fairclough Limited, Adlington, Lancs.: culverting of first public drain at Central Permanent Way Depot, Chesterton Junction

Standard Telephones & Cables Limited, London, N.11: supply and installation of control equipment in connection with the modernisation of the District Control Office, Stratford

Rotinoff Construction Limited, London, S.W.1.: stabilisation of earthworks, renewal of drainage and reballasting of permanent way between Shenfield and Chelmsford

British Railways, London Midland Region, have placed the following contracts:—

Henry Hope & Sons Limited, Smethwick, Birmingham: patent glazing for renewal of engine shed roof at Workington Motive Power Depot

Samuel Butler & Co. Ltd., Albion Works, Stanningley: supply, delivery and erection of steelwork for the reconstruction of part of the roof over platforms 3 and 4 at Carlisle Citadel Station

S. & C. Walmsley Limited, Liverpool, 10: supply and erection of steelwork for examination and repair shop at Crewe Motive Power depot

Leonard Fairclough Limited, London, S.W.1: the drainage and reballasting of the up and down main lines (former Great Central line) near Charwelton, between 135 miles 290 yd. and 135 miles 950 yd.

Joseph Westwood & Co. Ltd., London, E.14: supply and erection of steelwork for reconstruction and widening of Bridge No. 3 (Hythe Road) on Willesden No. 2 curve for the Hammersmith Corporation

H. & R. L. James, Wednesbury: staff amenities at Great Bridge Goods Depot

British Railways, Western Region, have placed the following contracts:—

Ericsson Telephones Limited, London, W.C.2: provision and installation of telephone train control equipment at Birmingham (Snow Hill) Station

E. Turner & Sons Ltd., Penarth Road, Cardiff: construction of a central signalbox at Carmarthen Junction

Adlon Erectors Limited, London, S.W.15: re-sheeting the roof of Nos. 1 and 2 spans and the east end verandah, Paddington Goods Shed

J. E. Jones & Co. Ltd., Blackwood: reconstruction of the station approach road bridge at Talybont-on-Usk

General Electric Co. Ltd., Coventry: provision and installation of equipment for additional extension lines for Paddington Station automatic telephone exchange

The Horsehay Co. Ltd., Horsehay, Wellington, Shropshire: supply of steelwork for the reconstruction of Backwater Bridge under the line near Windsor

W. H. Streeter Limited, Hampton, Middlesex: erection of a new roof to the round house and long shed and other works to be carried out at Cardiff (Canton) Motive Power Depot

Ten broad-gauge steam shunting locomotives are required for the Port of Calcutta. Details are given on page 252 under Official Notices.

The Special Register Information Service, Export Services Branch, Board of Trade, reminds United Kingdom exporters that it is most important that bids submitted to the Saudi Arabian Ministry of Communications shall be in the form explicitly required by the Ministry and received by the closing date.

Manufacturers in doubt about their bids arriving in time are advised to telegraph the Ministry of Communications stating the date on which the tender was posted in the United Kingdom and giving the total price. Every effort should, however, be made to ensure that bids are posted sufficiently early to reach Jedda by the closing date.

The Special Register Information Service, Export Services Branch, Board of Trade, reports that Ing. Enrique Pawling, owner of the firm Equipos para Ferrocarriles e Industrias, S.A., has informed the British Embassy at Mexico City that his firm would like to receive quotations from United Kingdom firms for the following:—

(*a*) Wheels for railway carriages and wagons. These either to be purchased or arrangements to be made for the licensing of patent rights

(*b*) Two railway wreckage clearing cranes of from 100 to 400 tons

Equipos para Ferrocarriles e Industrias, S.A., have been operating since 1948 as commission agents and representatives. Engineer Enrique Pawling, a civil engineer, is the head of the transport department of the government food importing agency (C.E.I.M.S.A.). Equipos para Ferrocarriles are considered to be a suitable connection for United Kingdom firms.

Manufacturers interested in this inquiry should write by airmail to Ing. Enrique Pawling, giving full particulars of their

products and quoting c.i.f. prices in U.S. dollars.

The Special Register Information Service, Export Services Branch, Board of Trade, reports that the Egyptian Republic Railways, Mechanical Department, Saptiah, Cairo, are calling for tenders (Tender No. 667), for the supply of twenty 20-ton refrigerator cars. The closing date for the receipt of tenders is October 14.

Specifications and conditions of contract may be obtained by suppliers on the official list from the address shown in paragraph one at a cost of £E.2.

The Director-General of Supplies & Disposals, New Delhi, is inviting tenders for:—

(*a*) 520 (13 sets) buffers, complete with all fittings

(*b*) 92 buffer plungers 13 in. dia. head (O.S.) for cylindrical buffers of broad-gauge wagons

Tenders, quoting reference SR1/16401-E/III for (*a*) and SRI/16332-E/III(A) for (*b*) will be received up to 10 a.m. on September 15.

If the date for the receipt of tenders does not allow sufficient time for tenderers to obtain tender forms from India, they may submit their quotation to India in their own letter form or by telegram so long as all essential particulars are given and provided they simultaneously apply for the tender forms and return them duly completed as quickly as possible on the basis of advance quotations already submitted.

A copy of the tender form can be examined at the India Store Department, 32-44, Edgware Road, London, W.2, on application to the "CDN" Branch. The drawings can be seen at the offices of Hodges Bennett & Company, 59-60, Petty France, London, S.W.1, from whom copies may be obtained at a fixed price per sheet.

The Special Register Information Service, Export Services Branch, Board of Trade, reports a call by the Stores Department, South African Railways, for tenders (Tender No. B.8106), for:—

8,000 Cardwell friction bolster Snubbers (South Africa), type A. Free height $8\frac{3}{8}$ in. $\pm \frac{1}{16}$ in. Base of snubbers $5\frac{1}{2}$ in. dia. max.

alternatively

8,000 friction bolster Snubbers, of a make to be approved, free height $8\frac{3}{8}$ in. $\pm \frac{1}{16}$ in. Base of snubber, $5\frac{1}{2}$ in. dia. max.

The closing date for the receipt of tenders is September 16. A copy of the tender documents including specifications and conditions of contract may be had on loan by United Kingdom firms in order of application to the Branch (Lacon House, Theobalds Road, W.C.1).

The Special Register Information Service, Export Services Branch, Board of Trade, reports a call by the Stores Department, South African Railways, for tenders (Tender No. B.6900), for:—

45 lubricators, locomotive, "Sight Feed" type (two feed)

180 lubricators, locomotive, "Sight Feed" type (four feed)

100 lubricators, locomotive, "Sight Feed" type (five feed)

The closing date for the receipt of tenders is September 30. A copy of the tender documents including specifications and conditions of contract may be had on loan by United Kingdom firms in order of application to the Branch (Lacon House, Theobalds Road, W.C.1).

Notes and News

Vacancy for Electrical Designer.—An electrical designer of traction motors and generators is required for work in connection with diesel electric traction. See Official Notices on page 252.

Traction Engineer Required. — The National Coal Board invite applications for a superannuable appointment as a traction engineer on the staff of its Production Department in London. See Official Notices on page 252.

Resident Engineer Required by British Railways.—A resident engineer is required by British Railways, Eastern Region, for civil engineering work, under the supervision of the visiting senior engineer. See Official Notices on page 252.

Assistant Traffic Superintendent Required.—Applications are invited for the post of assistant traffic superintendent, railway department, required for the Gold Coast Local Civil Service, for two tours each of 18 to 24 months in the first instance. See Official Notices on page 252.

Vacancies for Junior Assistant Engineers, South African Railways.—Applications are invited for junior assistant engineers, preferably under 30 years of age, required in the civil, mechanical and auto engineering departments of the South African Railways. See Official Notices on page 252.

A Paradox of Modern Railway Management.—In the article "A Paradox of Modern Railway Management," the first part of which appeared in our August 20 issue, the first sentence of the penultimate paragraph on page 207 should have read: "Railway operating statistics are no more than averages which provide a rough-and-ready measure of technical efficiency."

European Machine Tool Exhibition.—At the Fourth European Machine Tool Exhibition, to be held at Milan from September 14 to 23, George Fischer Limited, of Schaffhausen, Switzerland, will be exhibiting + GF + copying lathes on Stand No. 4805. The lathes to be shown include type KDM—18/150, with automatic thread-cutting device GSV, type KDM—7/50, with automatic loading device LEV and multi-cut recycling device 6A, and automatic copying lathe KDM—28/7-F2, which is a special chucking machine for the turning of ring-type components. Other models include type KDM—18/70, which has many automatic features, KDM—11/70 with automatic spindle actuation and automatic programme control, and type KDM—18/250.

Swindon Group Win Savings League Competition.—The members of the Locomotive A.E. Workshop Savings Group at Swindon, Western Region, British Railways, winners of the Savings League Competition, were presented recently with the Trophy by the Mayor of Swindon, Alderman A. M. Bennett, who is himself a railway worker. The Chairman of the Swindon Savings Committee, Mr. W. Bennell, was also present. There are over 50 groups in the shops and offices at Swindon Railway Works, with 2,183 members. Their target for 1954 is £50,000 and by the end of May they were well over halfway to their objective. Much of their success is due to Mr. H. R. Webb, Stores Superintendent, Western Region. For many years he has been Liaison Officer for National Savings at Swindon and by his enthusiastic energy has helped to build up the present savings organisation at the railway works.

Gift of U.S.A. Locomotives to Korean Railways.—Walter J. Tuohy, President of the Chesapeake & Ohio Railway, has advised President Syngman Rhee of the Republic of Korea that the C. & O.R. is presenting 12 more steam locomotives, making a total of 21, to the Korean National Railways. Nine steam engines were presented to South Korea on June 30. The 12 additional locomotives are all 0-8-0 shunting engines, built in 1930. The nine previous C. & O.R. locomotives included six shunting and three 2-8-0 freight tender engines.

Closing of Holywell Branch.—British Railways, London Midland Region, announce that the passenger and freight services between Holywell Junction and Holywell Town will be withdrawn on and from September 6, except that freight facilities will continue between Holywell Junction and Holywell Textile Mills, Crescent Siding. Bus services will be provided from and to Holywell Junction. Parcels and passenger train merchandise will be dealt with at Holywell Junction as at present. Alternative arrangements for dealing with freight train traffic have been made.

Brush Coachwork Limited Exhibition at Glasgow.—Brush Coachwork Limited, a member of the Brush Group of Companies, will open, in conjunction with J. R. Alexander & Co. Ltd., Automobile Distributors, an exhibition of battery electric vehicles at the showrooms of the latter company at 264/286, Great Western Road, Glasgow, C.4. The exhibition will open on September 14 and will continue for the two ensuing days. The display will feature types of vehicles designed for transport of materials inside and outside factories, docks and railway stations.

Model Engineer Exhibition.—Visitors to the Model Engineer Exhibition, which is open at the New Horticultural Hall, Westminster, until August 28, can see some 300 models of a high degree of workmanship. They embrace many branches of engineering, and locomotives and rolling stock are well represented. One locomotive, a 5-in. gauge Stirling 8 ft. single, took 10 years to build. There are also model ships, aeroplanes, traction engines, and scenic models among the exhibits. There are 13 entries for the Duke of Edinburgh Challenge Trophy which is for competition among previous prize winners. There are also numerous entries for other trophies. Trade stands exhibit a wide variety of supplies for the model-maker and many societies and clubs have stands in the hall.

Edinburgh Festival Travel Facilities.—British Railways, Scottish Region, are running special late return trains from Edinburgh to various places in Scotland during the International Festival of Music & Drama at Edinburgh. Each weekday from August 23 till September 11, a special train leaves Edinburgh Waverley at 11.15 p.m. for Linlithgow, Polmont, Falkirk, Lenzie, Bishopbriggs, and Glasgow, and one at 11.20 p.m. (Saturdays 11.30 p.m.) for Inverkeithing and other stations in Fife, also Dundee and Broughty Ferry. On August 28 and September 4 and 11, the 10.45 p.m. regular train from Edinburgh Princes Street to Glasgow will call specially at Uddington, Cambuslang, and Ruther-

glen. On Sundays August 22 and 29, and September 5, there will be an additional train to Glasgow from Waverley at 10.30 p.m., calling at Linlithgow and Falkirk. There will be cheap day, half-day and evening excursion facilities to Edinburgh from many stations during the Festival.

Corrosion Advice Bureau.—The British Iron & Steel Research Association has formed a Corrosion Advice Bureau to deal with the many inquiries for advice on the prevention of corrosion of ferrous metals. The bureau will be situated at 140, Battersea Park Road, London, S.W.11 (Telephone Macaulay 551). Dr. J. C. Hudson has been appointed Head of the Bureau and Mr. E. E. White, Secretary. Dr. W. H. J. Vernon has been engaged as consultant. The services of the bureau will normally be free to members of the Association, and also available to others on a fee-paying basis, depending on the extent of the investigations required.

Ministry of Materials Dissolved.—The Ministry of Materials was formally dissolved on August 16 and its remaining functions were transferred to the Board of Trade. These residual functions consist largely of managing strategic stockpiles of materials and disposing of terminal stocks, nearly 1,400,000 tons of which are expected to be sold this year. The sales value is estimated at £125,000,000. The Ministry was set up in 1951, and some 80 per cent of its functions were taken over from the Board of Trade. The reversion has entailed some administrative reorganisation at the Board of Trade, entailing a net increase of one division. Lord Woolton, who took over the additional office of Minister of Materials in September last, remains a member of the Cabinet as Chancellor of the Duchy of Lancaster.

British Permanent-Way Staff Visit Netherlands Railways. — Fourteen men from British Railways and London Transport who gained the highest marks out of over 1,000 employees who took evening classes in permanent-way construction and maintenance last winter, are to go to Holland on September 14 on a five-day tour to study the methods used on the Netherlands Railways. They will be accompanied by the two instructors whose classes achieved the best examination result during the course, which was held at 60 different centres. The classes were arranged to encourage the permanent-way staff to increase their knowledge of both the theoretical and practical aspects of their work, and consisted of 20 lectures and two outdoor periods of practical work. Subjects covered in the syllabus included the elements of permanent-way engineering; earth works; rails and their fixings; points and crossings; sleepers; bridges; electrified track and track circuits; and rules and regulations for the safety of the traffic and the staff.

Withdrawal of Passenger Services: Selby-Market Weighton—Driffield Branch.—The North Eastern Region of British Railways announces that because of heavy losses incurred in running the service, stopping trains serving the intermediate stations on the Selby—Market Weighton—Driffield branch will be withdrawn on and from September 20. The stations at Cliff Common, Bubwith, High Field, Foggathorpe, Holme Moor, Everingham, Enthorpe, Middleton on the Wolds, Bainton, and Southburn will then cease to cater for passengers. Each of these stations will continue to deal with parcels traffic, for which British Railways motors will give a C. & D. service. There will be no change in the method of dealing with freight traffic. Alternative road passenger facilities are available.

Highland Games Poster.—The design for the new poster shown in the accompanying illustration, which was produced by the Department of the Public Relations & Publicity Officer, British Railways, Scottish Region, is based on the scene at the 1953 Aboyne Games. The dresses depicted

Scottish Region poster showing 1953 *Aboyne Games*

accord with the latest regulations of the Aboyne Games Management Committee, and the poster has been approved by that committee. It is now being distributed for exhibition throughout this country, Canada, and U.S.A. This year's Aboyne Games take place on September 8.

Excursion to Derby Locomotive Works.—The London Midland Region of British Railways will run a special return excursion train from St. Pancras to Derby Locomotive Works on September 2. The fare will be 16s. 6d. Passengers will be taken on a conducted tour of the works by experienced guides. Children not younger than 12 may travel on this trip provided they are accompanied by adults. Refreshments will be available on the train.

National Road Transport Federation.—Concern at the growth in restrictions upon the operation of commercial vehicles in large towns is expressed by the National Road Transport Federation in its report for 1953-54. The constituent organisations of the Federation are the Road Haulage Association, the Traders Road Transport Association, and the Passenger Vehicle Operators Association. The report draws attention to "no waiting" requirements and unilateral waiting in certain stretches of road in London. The Federation feels that it is no answer to the problem of traffic congestion in large towns to impose a further restriction on commercial vehicles engaged in collection and delivery. Of 330 schemes for road building or alternative routes submitted to the Ministry of Transport after an investigation among members of the Federation, 50 per cent have been given short-term priority.

R. A. Lister Issue.—R. A. Lister & Co. Ltd. has announced proposals for an increase in the capital to £5,000,000 by the creation of 1,400,000 ordinary £1 shares; for the capitalisation of £1,040,000 of reserves; and the issue of 1,040,000 ordinary £1 shares fully paid up in the proportion of two for every five ordinary shares held.

Evening Excursions to Southend Illuminations.—From August 27 until September 18, inclusive, the Eastern Region is arranging for evening excursion trains to run every Friday and Saturday from Liverpool Street to Southend (Victoria) and from Fenchurch Street to Leigh-on-Sea, Chalkwell, Westcliff and Southend (Central) for the illuminations.

Accident to "Santa Fe Chief."—The "Santa Fe Chief" was derailed on August 22 near Lomax, Illinois, while travelling from Chicago to Los Angeles. At least five persons are reported to have been killed, and many more injured. The train is believed to have struck refrigerator vans in a siding. The first reports said that only the locomotive and mail van remained on the rails.

Fishguard & Rosslare Railways & Harbours Company.—The net revenue of the Fishguard & Rosslare Railways & Harbours Company for the half year ended June 30, 1954, was £35,563. This figure is arrived at after deducting £49 representing directors' and auditors' fees, and £129 for salaries and expenses, from the £35,741 provided under guarantee by the B.T.C. and C.I.E. No dividend was declared on the ordinary shares or on the new 3½ per cent preference stock, 1914, as these are held by the parties guaranteeing the interest on the capital represented thereby.

July Exports to Sterling Area.—United Kingdom exports in July were valued at £246,900,000, which was slightly above the previous peak for the year in March and the highest monthly value since January, 1952. Exports of engineering products were 11 per cent above the monthly average for the second quarter of the year. The gains were largely in exports of cars and commercial vehicles, aircraft, ships, and boats. Exports of electrical machinery, at nearly £16,000,000, were 11 per cent more in July than the average for the second quarter. Imports, at £289,700,000, were 1 per cent below the figure for July, 1953. Re-exports amounted to £9,100,000.

Merger of Permali Limited and Hordern-Richmond Limited.—The directors of Permali Limited announce that, subject to the necessary consents being obtained, a merger has been arranged between the company and Hordern-Richmond Limited. Mr. Lawrence Robson, Chairman of Hordern-Richmond Limited, will join the board of Permali Limited. Permali Limited, whose shares were marketed in February last on the London Stock Exchange, are manufacturers of densified wood laminates and bakelised paper products, primarily for electrical insulating purposes, under the trade names Permali and Dialam, and Hordern-Richmond are manufacturers of Hydulignum wood laminates and other products.

Railway Stock Market

Apart from a slightly easier tendency in British Funds, the important new issues made recently had little effect on stock markets, which remained active with further gains in the industrial sections. A decision on the next issue of de-nationalised steel is expected before long, and the general belief is that it will be Whitehead Iron or Dorman Long or possibly Colvilles. Steel shares yielding around 7 per cent are much more attractive, now that there has been a general advance in markets in the past few months and a lowering of yields on industrial shares. As to the political risk of future re-nationalisation in the event of a change of Government, it seems very unlikely that compensation would be less than the low prices at which the shares are being offered back to the public.

Dominion rails again showed a number of features, with continued activity in White Pass no-par value shares still in evidence, though after their recent sharp advance, it is not surprising there has been some profit-taking and the price has receded to $31¼. The convertible debentures were back to £110, and the 5½ per cent unsecured loan stock £33.

Canadian Pacifics have not held best prices at $48¾, despite the not unattractive yield and general expectations that the rate of dividend is likely to be maintained. The 4 per cent non-cumulative preference stock again changed hands around £68, while the 4 per cent debentures strengthened to £91¼.

Algoma Central & Hudson's Bay 5 per cent first mortgage income debentures were $247½, and the voting trust certificates 77s. 6d.

A minor feature has been renewed demand for Midland Railway of Western Australia ordinary stock, in which there were dealings up to 27½; the 4½ per cent first mortgage debentures were quoted at 92½ and the income debenture stock at 40.

Nyasaland Railways 3½ per cent first debentures remained at 79½, but there was further speculative buying of the £1 shares, which changed hands around 5s. 9d.

Among foreign rails there was again a fair number of dealings in Antofagasta stocks, though best levels were not held, the ordinary easing to 8¼, but the 5 per cent preference was better at 42; the 4 per cent debentures were 49 and the 5 per cent (Bolivia) debentures 71.

There was a lower price for United of Havana second income stock at 36 and the consolidated stock was 5¼. In other directions, Nitrate Rails shares were 20s. 3d. and Taltal Railway shares 13s. 6d.

San Paulo Railway ordinary units were 3s. 9d. and Brazil Railway bonds have changed hands at 8¼.

Business at 7¼ was shown in Costa Rica ordinary stock, while the first and second debentures were 65 and 47½ respectively. Dorada ordinary stock again reflected renewed demand, changing hands up to 86. Chilian Northern first debentures have been dealt in at 27¼, and Guayaquil & Quito first debentures at £60½. Cordoba Central "B" debentures were again dealt in at 56.

Among Indian stocks, business at 104 was recorded in Barsi and at around 91½ in West of India Portuguese 5 per cent debentures.

Wider recognition of their investment merits and hopes of a somewhat more liberal dividend policy drew attention to shares of road transport companies, many of which remain so firmly held that they are in short supply in the market. Aldershot & District marked 30s. 6d. xd. East Kent around 27s. 6d., Potteries Motor Traction 31s. 6d. and Maidstone & District 26s. 3d. Southdown were 34s., West Riding 34s. 9d. and Lancashire Transport 61s. 3d. B.E.T. 5s. "A" deferred units were active at the higher level of 61s.

Vickers showed activity again in engineering and allied shares but came back to 39s., while Guest Keen at 63s. 6d. also moved against holders. T. W. Ward were back to 51s., but among steel shares, the premium on Stewarts and Lloyds was 2s. 10½d., as compared with a discount of 7½d. when dealings started.

Beyer Peacock at 44s. 3d. have been firm in shares of locomotive builders and engineers. Charles Roberts 5s. shares, after improving, eased to 9s. 10½d. Birmingham Carriage were 27s. 4½d., Hurst Nelson 42s. and North British Locomotive 15s. 9d. Gloucester Wagon 10s. shares have been dealt in around 20s., Wagon Repairs 5s. shares were 13s. 6d., and Vulcan Foundry moved up to 29s.

OFFICIAL NOTICES

The engagement of persons answering Situations Vacant advertisements must be made through a Local Office of the Ministry of Labour or a Scheduled Employment Agency if the applicant is a man aged 18-64 *inclusive or a woman aged* 18-59 *inclusive unless he or she, or the employment, is excepted from the provisions of the Notification of Vacancies Order*, 1952.

NORTH BRITISH LOCOMOTIVE CO. LTD., Glasgow, require the services of senior draughtsmen with diesel electric and mechanical locomotive experience. Alternatively men with sound mechanical experience would be considered. Apply in writing to the Diesel Traction Chief, stating full experience, age and qualifications.

ELECTRICAL DESIGNER of traction motors and generators required for work in connection with diesel electric traction. Candidates should have good academic attainments together with wide experience of the electrical and mechanical design of traction machines and the manufacturing techniques associated with these machines. Applications giving full details of qualifications, experience, etc., should be addressed to the Chief Personnel Officer, Brush Electrical Engineering Co. Ltd., Loughborough, Leics.

WORKS MANAGER required for Rolling Stock Builders abroad. Previous experience in the manufacture of Steel Railway Vehicles is desirable, although not essential, but applicants should have previously held a managerial appointment. Commencing Salary up to an equivalent of £188 Monthly, but according to qualifications. Provident Fund, free quarters, car, medical attention and passages for family. Apply, in writing, only stating age and whether married and giving full details of experience and technical education to Box 322, *The Railway Gazette*, 33, Tothill Street, London, S.W.1.

ASSISTANT TRAFFIC SUPERINTENDENT, RAILWAY DEPARTMENT, required for the Gold Coast Local Civil Service for two tours each of 18-24 months in the first instance. Non-pensionable. Commencing salary according to experience in salary scale (including expatriation pay) £1,330 rising to £1,680 a year. Outfit allowance up to £60. Gratuity at rate of £150 a year. Free passages. Liberal leave on full salary. Candidates must have a thorough knowledge of electric train staff working, pilot working, double line block system, etc., centralised train control system, the working of shunting yards, train running and traffic statistics. They should also have experience of all sections of passenger and goods station working including accounts, rates and fares and claims. Write to the Crown Agents, 4, Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience and quote M3B/33427/RA.

VACANCIES FOR ENGINEERS, SOUTH AFRICAN STATE RAILWAYS Vacancies for Junior/Assistant Engineers exist in the Civil, Mechanical and Auto Engineering Departments of the South African State Railways, and qualified persons desirous of being considered in connection with the filling thereof must submit their applications, containing full particulars of qualifications held, experience, age, martial status, etc., to the S.A.R. Recruiting Mission, Room 346, South Africa House, Trafalgar Square, London, W.C.2. A degree in civil or mechanical engineering, as the case may be, is required, and applicants must preferably be under 30 years of age. The appointments are graded as follows:— Junior Engineer, £480 × £50—£580 p.a.; Assistant Engineer, £650 × £50-£950 × £40—£1,030; plus cost of living allowance, the present rate being £352 to £110 p.a. for married and single servants, respectively. Attractive conditions of service, including free passage to South Africa, are offered. Apply to the above mentioned address for fuller details.

RESIDENT ENGINEER required for Civil Engineering work, under supervision of visiting Senior Engineer, for duties over any part of the Eastern Region of British Railways. Salary £649/£729 per annum. Residential and other reduced rate travelling facilities after qualifying period of service. Apply in writing giving full particulars as to age, education, training and experience, previous positions held and any special qualifications possessed, to Civil Engineer, British Railways, Eastern Region, Kings Cross Station, London, N.1.

NATIONAL COAL BOARD invite applications for a superannuable appointment as a TRACTION ENGINEER on the staff of their Production Department in London. The successful candidate will be required to undertake traction work embracing a wide range of difficult but interesting problems, both on the surface and underground throughout the coalfields. Applicants must have good technical qualifications and must be capable of carrying out responsible work on projects, design, development and testing. Considerable experience with diesel traction is necessary, particularly with the smaller sizes of diesel locomotive. Salary will be in the range £1,100 to £1,550 per annum according to qualifications and experience. Write, giving full particulars (in chronological order) of age, education, qualifications and experience (with dates) to National Coal Board, Establishments (Personnel), Hobart House, Grosvenor Place, London, S.W.1, marking envelope TT/829. Original testimonials should *NOT* be forwarded. Closing date October 5, 1954.

THE COMMISSIONERS FOR THE PORT OF CALCUTTA. Tenders are invited from British, Continental and American Manufacturers for the supply of 10 Broad Gauge Shunting Type Steam Locomotives with spare boiler and accessories. Tender forms and specifications may be obtained from Messrs. Rendel, Palmer & Tritton, Consulting Engineers and London Agents to the Commissioners, upon payment of a fee of 10s. which is not refundable under any circumstances. Tenders should be submitted in sealed covers superscribed "Locomotives —Port of Calcutta" and addressed to Messrs. Rendel, Palmer & Tritton, 125, Victoria Street, Westminster, London, S.W.1, so as to reach them not later than 2 p.m. on September 21, 1954.

BOUND VOLUMES.—We can arrange for readers' copies to be bound in full cloth at a charge of 25*s.* per volume, post free. Send your copies to the SUBSCRIPTION DEPARTMENT, Tothill Press, Limited, 33, Tothill Street, London, S.W.1.

Forthcoming Meetings

Until August 28 (*Sat.*)—"The Model Engineer" Exhibition, at the New Horticultural Hall, London, S.W.1.

September 3 (*Fri.*).—The Railway Club, at 57, Fetter Lane, London, E.C.4, at 7 p.m. Paper entitled "The Bexley Heath Railway," by Mr. E. A. Course.

September 6 (*Mon.*). to September 14 (*Tue.*) —Institute of Metals; Forty-sixth Annual Autumn Meeting in Switzerland.

September 7 (*Tue.*).—Permanent Way Institution, Leeds & Bradford Section, at British Railways Social and Recreational Club, Ellis Court, Leeds City North Station, at 7 p.m. Paper on "Permanent Way 'Mechanical Muscles' in use on British Railways," illustrated by lantern slides, by Mr. R. C. Mosedale, Senior Technical Assistant to District Engineer, Leeds, N.E.R.

September 10 (*Fri.*).—Locomotive Society of Scotland, at 302, Buchanan Street, Glasgow, C.2, at 7.15 for 7.30 p.m. Paper entitled "G.W.R. Reminiscences," by Mr. John Drayton.

Until September 25 (*Sat.*).—"Popular Carriage" Exhibition (Two centuries of carriage design for road and rail) in the Shareholders' Meeting Room, Euston Station, London, N.W.1. Weekdays 10 a.m. to 7 p.m.; Sundays 2 to 7 p.m.